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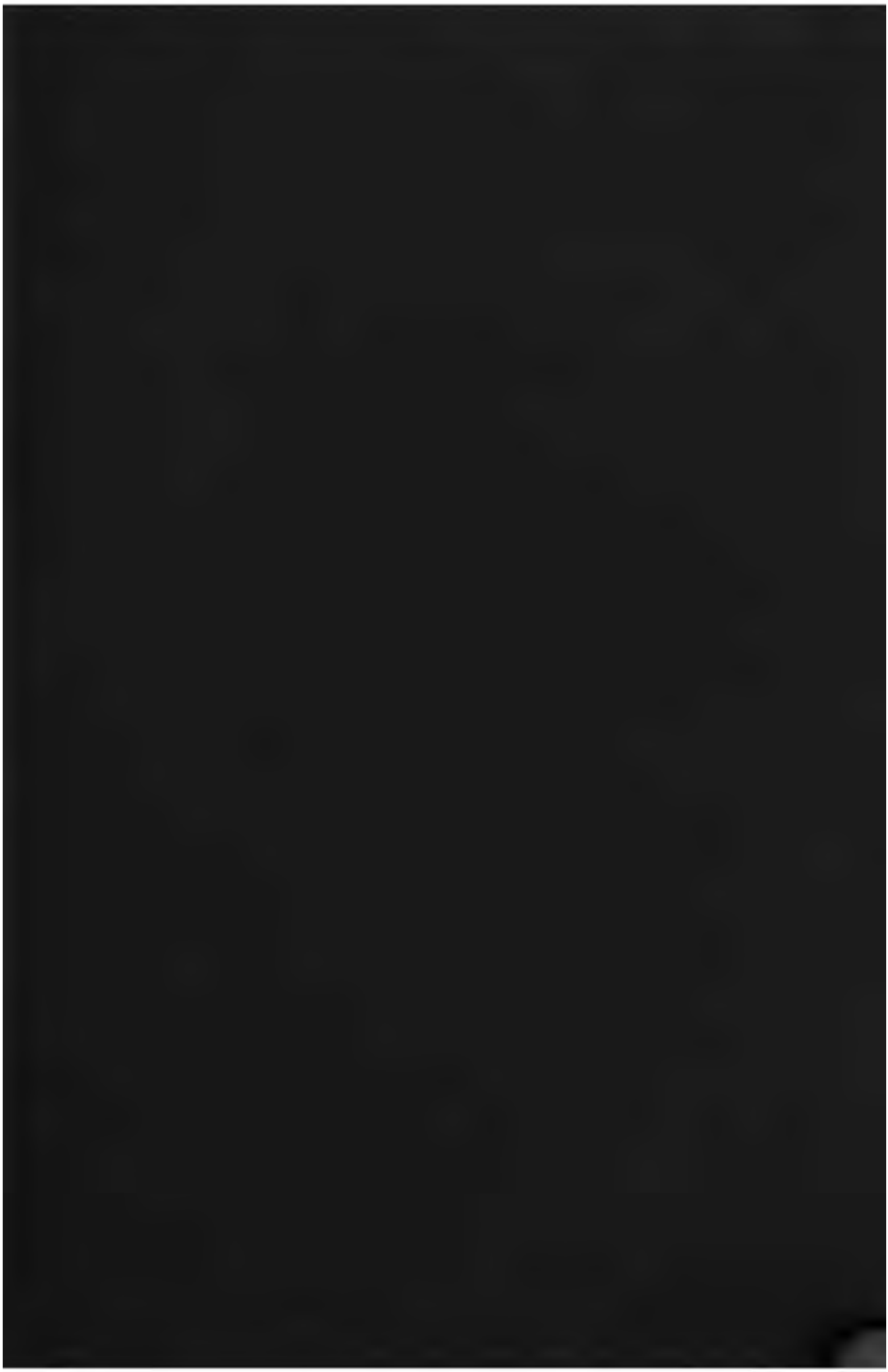

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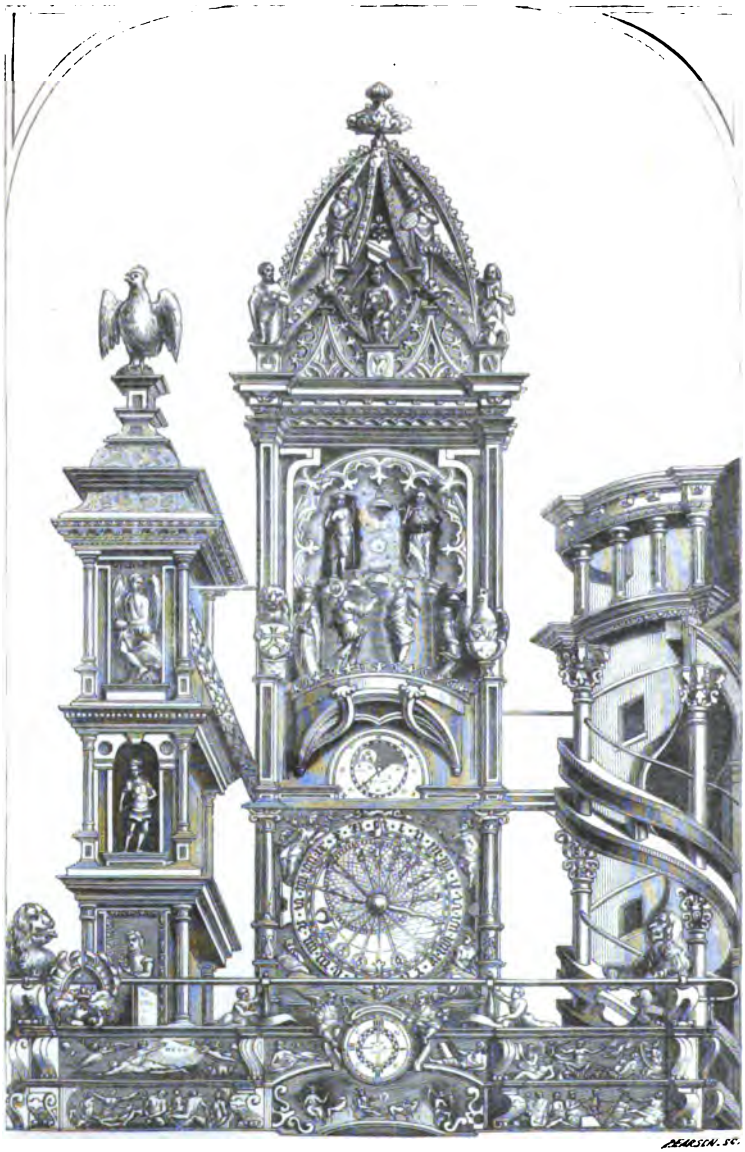

STRASBURG CATHEDRAL CLOCK.

8-30315

CURIOSITIES OF CLOCKS

AND WATCHES

FROM THE EARLIEST TIMES.

BY EDWARD J. WOOD.

SKULL WATCH OF MARY QUEEN OF SCOTS.

LONDON:
RICHARD BENTLEY, NEW BURLINGTON STREET,
Publisher in Ordinary to Her Majesty.
1866.

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PREFACE.

THE Author is indebted for the idea of this Work to the late Mr. WILLIAM J. PINKS, whose 'History of Clerkenwell' he lately edited and finished, and who wrote a few short suggestive Notes upon the Curiosities of Clocks and Watches, which were published during his lifetime in a local periodical to which he contributed occasional papers.

The Author is also indebted to his obliging friends, Dr. ROBERT BIGSBY (through whom he has recently received a Diploma of Membership of the Assemblea di Storia Patria in Palermo), THOMAS S. BIRD, Esq., JOHN BULLOCK, Esq., and T. C. NOBLE, Esq., for many items and hints, of which he has availed himself during his preparation of this Work. To these gentlemen he gratefully offers his sincere thanks for their valuable aid.

NOVEMBER, 1866.

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CURIOSITIES OF CLOCKS,

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CHAPTER I.

Time — First Divisions of Time — Various Divisions of Time — Etymology of the word Clock — The Sundial — Clepsydræ, or Water-Clocks — Uses of — Curious Water-Clocks — Liliwati — King of Persia's Timepiece — The Sand-Glass — Candle-Clock of Alfred the Great — Invention of Wheel-Clocks — Clocks in Early Monasteries — First Clocks in England — Clock of the Old Cathedral of St. Paul, London — Agreement relating to — Paul's Jacks — Clock in the New Cathedral — Traditional Story relating to — The Old Clock at Westminster — Sir Ralph De Hengham's Fine — The Keeper of the Clock — Great Tom — First Clock at Canterbury — Clock at St. Andrew's, Canterbury — First Portable Clocks — Poetical references to — Bohemian Clock — Exeter Cathedral Clock — Dante's reference to a Clock — Norwich Cathedral Clock — Chaucer's reference to a Clock — St. Alban's Abbey Clock — Richard de Wallingford — Courtray Clock — Padua Clock — Glastonbury Abbey Clock — Welsh Bard abuses a Clock — Froissart's reference to a Clock — Clock at Dover Castle.

WHILE recording some of the curiosities, oddities, and anecdotes of the history of horology, it is not our intention to enter upon mere mechanical details, or technical descriptions of clock and watch work; although, without doubt, the marvellous combinations of mechanism which have been made at various periods for the purpose of measuring time are among those curiosities; but if we were to attempt to describe the anatomy of the instruments about which we are treating, we should be drawn into a discourse that would be better suited to an encyclopedia than to a book for general readers

such as this one is intended to be. The reader of these pages probably would not care to be informed about the differences in the construction of the escapement of a clock or watch; but we think he will peruse with interest the general description of clocks which do almost everything, including talking, and of watches that chant and converse, and are in the forms of skulls, animals, fruits, and flowers. With these prefatory remarks, which are intended to convey some forenotion of the matter and manner of our subject, we enter upon it, fully assured that it is in itself most entertaining, however unskilfully we may treat it.

Instruments or machines for measuring time being the subjects of this book, it may be well perhaps for us to consider what time is. Figuratively Time is a well-known old man with a scythe, an hour-glass, a pair of wings, and a venerable brow, on which is a solitary forelock; but in the abstract, time is less definable. Johnson, deriving the word from the Saxon, *tima*, and the Erse, *tym*, says that time is a measure of duration. This definition is more simple and less philosophical than that of Aristotle and his sect, who described time as a multitude of parts of motion. Another school held that it was "an object of imagination, or an attribute given to things by the mind while contemplating them as enduring or ceasing." Others tell us that time is "a succession of phenomena of the universe." And Laplace described it as "the impression which a series of objects leaves upon the memory, and of which we are certain the existence has been successive." In the 'Talisman' we are told that time is seen not, and felt not, and that "it is but a shadowy name, a succession of breathings measured forth by night with the clank of a bell, by day with a shadow crossing along a dial-stone."

Another author asks, "What is time? Protention? true; but do we estimate it by our watches?" Poetically speaking, we may call time the life of nature.

We are told that the division of the day into hours was first suggested by the regular exercise of the bodily functions of a consecrated monkey, called the Cynocephalus; but this indelicate story is probably a mere antiquated error. It is said that among the early Romans the natural day, reckoned from sunrise to sunset, was divided into twelve hours; these hours, of course, varying in length according to the season. The ancient Egyptians, Mexicans, and Persians reckoned the beginning of the day from sunrise. It was divided into four intervals, determined by the rising and setting of the sun and its two passages over the meridian. This was an arrangement not likely to have originated anywhere except in a low latitude, where the four divisions thus formed are never subject to any considerable inequality. When the interval called a day, and containing twenty-four hours, really begins and ends is rather uncertain, for some nations begin the day at sunrise, some at sunset, some at mid-day, and some at midnight. It is not exactly known when the present mode of beginning the day at midnight first came into use; but it appears to have been an ecclesiastical invention. The natural day obviously commences at sunrise, and ends at sunset, when the natural night begins; and this seems to have been the earliest system of reckoning. Afterwards the day and night became each divided into four parts; and long after this, the division into hours was introduced, to correspond with the division of the year into months; and the first hours were therefore twelfths of the whole interval from the commencement of one day to that of the next; and probably the subdivision into twenty-four

hours arose from dividing both the natural day and night into twelve equal parts.

We may infer that hours, uniformly of sixty minutes, were not used until some mechanical means of measuring time, as by the wheel-clock, had been generally introduced; for although the sundial and clepsydra, or water-clock, are of great antiquity, they formerly represented hours of a length varying with the season; and the latter was adjusted to furnish hours of fifty to seventy minutes each, in order to suit the changing lengths of day and night. So the clepsydra of the Indians gives about twenty-four minutes to a ghuree, thirty of which make twelve hours, or the period from sunrise to sunset. In low latitudes the difference in the day's length is comparatively insignificant; and probably the ancients got on well enough by setting their water-clocks every evening, as the modern Romans and Neapolitans used until lately to set their watches, namely, when they heard the Ave Maria bell. They began their day half-an-hour after sunset, and counted twenty-four hours. In most parts of Italy ordinary clock time is now kept; but in the convents the old practice of keeping ecclesiastical time, that is, dividing the day from dawn to dark into twelve equal parts, and the like with the night, is still in use. In the summer solstice at Rome, the day is fifteen hours and six minutes in length, and each hour of the day is really seventy-five minutes long. The night, on the contrary, is actually eight hours and fifty-four minutes long, and each hour consists of forty-four minutes. The old clock-faces, like that at St. Peter's, were divided only into six parts instead of twelve, and the hands went round four times in the day and night. This custom of dividing the natural day and night into twelve equal portions,

necessitated the setting of the clocks every night and morning. The hour of prime was given out by striking successively three strokes on the bell of the principal church, then four, then five, then one single stroke; in all thirteen, representing our Saviour and the twelve Apostles. Then all the churches set their clocks and tolled out the hour. The like was done every evening at vesper time. Doubtless this custom is that which is alluded to by Iago in 'Othello,' when he says of Cassio —"He'll watch the orologe a double set if drink rock not his cradle." The double set meaning twice twelve hours.

A traveller at Chivasso, about 1729, tells us that he was puzzled to reconcile the Italian clocks with the French and German method of computing time; for an hour after sunset they struck one, and so progressively to twenty-four. In some places the clocks struck no more than twelve, in others only six, beginning again at one. He found at Nuremberg the principal clocks striking the hours from one to twelve progressively from the rising of the sun, and beginning again after sunset.

In Japan the twenty-four hours are divided into twelve periods of time, six of which are appropriated to the darkness and six to the light. The day being calculated from sunrise to sunset, there is a necessary variation in the length of the six day and six night hours, the latter being the longest in winter, the former in summer. The clocks are therefore altered periodically to suit the seasons of the year.

The general name of every instrument that in any way measured the motion of time was anciently horologium, and this name was used whether it referred to a sundial, clepsydra, sand-glass, or clock. The

etymon of the word clock is variously stated; thus, we have the following:—Saxon, *clugga*, *clucga*; German, *klocke*; Armoric, *cloch* or *clech*; Irish, *clog*; Welsh, *cloc*; Belgic and Danish, *kloke*; Teutonic, *glocke*; French, *cloche*; Latin, *glocio*; Chinese, *glog*. It originally meant only a bell for striking a sound, and that signification it still retains in the French language. Clocks, even at so late a period as the reign of James I., were often called horologes. Up to the fourteenth century the word clock was applied only to the bell which rung out the hour, or certain periods, determined by the sundial or sand-glass. One writer says that there does not appear any passage which alludes to a clock by that name earlier than the thirteenth year of the reign of Henry VIII.; but this is a mistake, for Dr. Reginald Pecock, sometime Bishop of Chichester, in his work 'The Repressor of over-much Blaming of the Clergy,' written about 1449, distinctly mentions a clock. As an evidence of the truth of an argument based upon the fact that express mention is not made in Scripture of many things which are lawfully used in the service of God, he says: "In al Holi Scripture it is not expressid bi bidding, counseiling, or witnessing, or bi eni ensaumbling of persoon . . . . . that men schulde make and vse clockis forto knowe the houris of the dai and nygt; for thou in eeldist daies, and thou in Scripture mensioun is maad of orologis, schewing the houris of the dai bi schadew maad bi the sunne in a cercle, certis neuere saue in late daies was eny clok telling the houris of the dai and nygt bi peise and bi stroke, and open it is that nouwhere in Holi Scripture is expresse mensioun mad of eny suche." Lydgate, who was born about 1375, and died about 1461, says in his prologue to the 'Storye of Thebes,' "I will myself

be your orlogere tomorrow early." The bell of Wells Cathedral is to this day called the horologe.

One of the earliest means of marking the hours was the gnomon, or sundial, which was originally no more than a column that, raised above the earth towards the sun, offered a substance, which by casting a shadow of varying position and length, denoted the various times of the day. The earliest mention of a sundial is in the second book of Kings, chapter xx., verse 11, "And Isaiah the prophet cried unto the Lord: and he brought the shadow ten degrees backward, by which it had gone down in the dial of Ahaz." The word dial is the same as that translated as degrees in the same verse; therefore this record must be received with caution, particularly because Ahaz was king of Judah from the year 741 to 726 B.C., and the invention of the sundial is generally attributed to Anaximander, about two hundred years later than this time.

Long before the Christian era, clepsydræ, or water-clocks, were in use; but the name and time of the inventor of these instruments have not been reliably recorded. It is said that the Censor Scipio Nasica was the first who measured the hours by water, by night as well as by day, in the year 595 B.C. The nature and general fashion of the instrument originally employed by the Greeks, and subsequently used in Rome, for measuring time by the escape of water, may be understood from passages in the works of Aristotle and other ancient writers; but representations of the clepsydra are of very rare occurrence. One in a bas-relief at the Mattei Palace in Rome closely resembles in form the hour-glass of the present day. The principle of these earliest mechanical contrivances for the measurement of time was very simple. In those of the common

kind, the water issued drop by drop through a small hole in the vessel that contained it, and fell into a receiver, in which some light floating body marked the height of the water as it rose, and by these means the time that had elapsed. In a bas-relief of the date of the Lower Empire, figuring the Hippodrome in Constantinople, a clepsydra in the shape of an oviform vase appears. It is very simply mounted, being traversed by an axis, and turned with a crooked handle. By this contrivance the instantaneous inversion of the vase was secured, and the contents escaping in a certain definite time showed the number of minutes which were taken up by each missus, or course.

Vitruvius tells us of the construction of a clepsydra, which, besides the hours, told the moon's age, the zodiacal sign for the month, and several other things; in fact it was a regular astronomical clock. His details now read somewhat obscure and complicated; but the principle was that a float, as it moved upwards by means of a vertical column fixed in it, drove different sets of cog-wheels, which impelled in their turn other sets, by means of which figures were made to move, obelisks to twirl round, pebbles to be discharged, trumpets to sound, and many other tricks to be put into action. The admission pipe for the water was made either of gold, or a perforated gem, in order that it might not wear away or be liable to get foul. In other clepsydræ the lower vessel had a graduated scale marked upon its side, and the rising surface of the water, as the bottom vessel filled, indicated the hours upon the scale. Sometimes floats were placed upon the water, and communicated with wheels, which thereby worked hands upon the faces of dials; or were made to support human figures, which pointed with

wands to numbers upon vertical scales as the water rose. In other water-clocks the ingenuity of the makers was brought into play, and the fluid flowed as tears from the eyes of automata. These water-clocks seldom indicated the true time of the day, for they had two great defects: the one being, that the water ran out with greater or less facility as the atmosphere was more or less dense; and the other, that the water flowed quicker when it had nearly run out than when first permitted to flow.

By the Egyptians (who made water-clocks in the forms of apes urinating) clepsydræ were used to measure the motions of the stars. The so-called Temple of the Winds at Athens was a clepsydra on a large scale, and is said to have been the chronometer and weather-guide of Athens. Ctesibius, of Alexandria, a mechanician skilled in hydraulics two centuries before the Christian era, is stated to have invented clepsydræ to mark the progressive steps of time, and not merely the lapse of a fixed period. He constructed one in which the fall of water turned some toothed wheels, which gave motion to a column; the water thereby raised or lowered a small statue, that pointed with a truncheon to the months and hours engraved upon the column. Another clepsydra, also invented by him, was a cylindrical vessel filled with water, bearing a float loosely fitting its interior, out of which rose a vertical gauge marked with the hours, which by its gradual ascent as the water entered through a small aperture into the cylinder, showed the passing away of the day with tolerable accuracy. In another horologium of this kind a dial, painted with a representation of the world and the zodiac, was traversed by an axis, on which was wound a flexible brass chain, supporting by its one

end a float, and on the other a balance weight equal to that of the float. As the latter rose with the water, the balance weight descending unwound the chain and made the dial revolve. It would seem that some clepsydræ had a regular dial face and one hand, set in motion by a string and float, similar to the index in our wheel-barometers.

Clepsydræ were introduced into Rome about one hundred and fifty-seven years before the Christian era; and by Pompey their use was commanded in the Roman judicial courts to regulate the lawyers in their pleadings. "This," says an ancient writer, "was to prevent babbling; that such as spake ought to be brief in their speeches." These clocks were very simple in their arrangement, being mere vases that were inverted by an attendant. Pliny incidentally mentions that each marked the third of an hour. This custom supplies Martial with a humorous allusion, where, describing a dull declaimer repeatedly moistening his throat with a glass of water during the progress of his endless harangue, he suggests that it would be an equal relief both to himself and to the audience, if he were to drink every time out of the clepsydra itself.

The Romans had various kinds of clepsydræ, which marked the hours in different ways. They called the instrument horologium hibernum, or winter clock, and sometimes also horologium nocturnum, or night clock, in opposition to the sundials, which were of little use in the winter, and of no use in the night.

Julius Cæsar, when he invaded the shores of our island in the year 55 B. C., is said to have found a water-clock in use among the natives; and by the help of it to have observed that the summer nights in Britain were shorter than those of Italy. That water-clocks

were early used in India there is good presumption afforded by the arithmetical treatise of one Bhascara Acharya, written in the twelfth century. Of the daughter of this learned Indian it had been predicted that she should die unmarried. Her father resolved, if possible, to avert so harsh a fate. Having made a choice of a husband for her, and obtained an astrological determination of a lucky hour, he placed the young damsel, Liliwati, adorned as a bride, near the water-clock, to wait and watch for the auspicious hour. But in vain, for it passed unobserved; and on looking to the clock which should have prevented such a mischance, the maiden found that a pearl which had become detached from her dress had fallen into the water, and closed the opening through which it should have flowed. Her father, thus disappointed, sought to console his child by saying to her, "I will write a book in your name, which shall remain to the latest time." This he did, and 'Liliwati' is a Work now known to Hindu scholars. The Brahmins of India, who still divide the natural day into sixty hours, measure time by the running of water, by means of a copper bowl with a hole in it. This vessel they leave floating on the water, and when it is full they empty it, and strike the hour of the day or night upon it.

In course of time the water-clocks became less simple in their construction, and by the addition of some mechanism they were made to perform many marvellous things. In the year 800, the King of Persia, Abdalla, or in the year 807, the King of Persia, Haroun-al-Raschid, sent, by two monks of Jerusalem, to the Emperor Charlemagne a time-piece, which presented the first rudiments of a striking-clock. According to Abbot Eginhart, who was an eye-witness of it, twelve

figures of horsemen when the twelve hours were completed issued out of twelve windows in this horologe, which until then stood open, and returning again shut the windows after them as they marched back. This appears to have been only a water-clock, curiously constructed of brass. The hours were noted by the sounding of a cymbal, and the striking of the hours was managed by the fall of twelve brass balls on a bell or bells placed beneath them. It is recorded that this clock had many other curious mechanisms, and was regarded as a great novelty in Europe.

Fabyan relates, on the authority of Gaguin, that among the presents sent in 807 to Charlemagne by the King of Persia, "was an horologe of a clocke of laten of a wonder artyfycyall makyng, that at euery oure of the daye and nyghte, when the sayd clocke shuld stryke, images on horse backe apperyd out of sondry places, and aftir departid agayn by meane of certayne vyces." Record, writing in 960, says this instrument was a clepsydra. To such a device Horman seems to allude when he says, "Some for a tryfull pley the deuyll in the orlege; aliqui in nugis tragedias agunt."

Gifford, in his 'History of France,' thus describes Charlemagne's clock: "But what particularly attracted the attention of the curious, was a clock worked by water. The dial was composed of twelve small doors, which represented the division of the hours; each door opened at the hour it was intended to represent, and out of it came the same number of little balls, which fell one by one, at equal distances of time, on a brass drum. It might be told by the eye what hour it was by the number of doors that were open; and by the ear, by the number of balls that fell. When it was twelve o'clock, twelve horsemen in miniature issued

forth at the same time, and marching round the dial, shut all the doors."

By this time the Romans had learned to make sounding clepsydræ; and later still, Lucian describes among the numerous conveniences of certain newly-built baths, an horologium that proclaimed the hour by means of a roaring sound. This sound was no doubt produced by hydraulic pressure upon the air contained in a cupola with pipes attached to it.

The hour-glass, in which sand took the place of water, was a modification of the clepsydra. These time-measurers were called clepsammia, and were in use before the days of Jerome (A. D. 331–420), who is usually described in his pictures at his study with a clock hanging by.

Candle-clocks were among the various methods which were adopted by men in past ages to measure and apportion their time. According to Asser, Alfred the Great, when a fugitive in his own country, vowed that if he should be restored to his kingdom again he would devote a third of his time to the service of God. This vow he afterwards fulfilled by appropriating eight hours of the day to acts of religion, eight to public business, and as many to sleep, study, and refreshment. To measure and rightly divide his time, he adopted the following simple expedient: he procured as much wax as weighed seventy-two pennyweights, which he commanded to be made into six candles, each twelve inches in length, with the divisions of inches distinctly marked upon it. These being lighted one after another regularly, burnt four hours each, at the rate of an inch for every twenty minutes. Thus the six candles lasted twenty-four hours. The tending of these candle-clocks he confided to one of his domestic chaplains, who con-

stantly from time to time gave him notice of their wasting. But when the winds blew, the air, rushing in through the doors, windows, and crevices of his rude habitation, caused his candles to gutter, and, by fanning the flame, to burn faster. The ingenious king, in order to remedy this serious inconvenience, caused some fine white horn to be scraped so thin as to be transparent, which he let into close frames of wood; and in these primitive lanthorns his wax-clocks burnt steadily in all weathers. The 'Eulogium Historiarum,' under the date 878, tells this story as follows:—"Iste Aluredus diem et noctem in xxiiii horis dividebat, secundum Bedam, per candelam ardentem in capella sua die et nocte. Octo enim horas in labore corporali circa regni negotia, octo in legendo et scribendo et docendo, quia vir literatus in scientia, octo in orationibus faciendis et in eleemosinis."

It is impossible to state with accuracy the time when wheel-clocks were first invented, and commenced to supersede the ancient time-measurers. Ingenious men of several centuries, from Archimedes, two hundred years B.C., to Wallingford, at the commencement of the fourteenth century, have been named as the inventors of the clock.

Roberts, in his "Dissertation on the History of the Antient British Church" appended to his work 'The Chronicle of the Kings of Britain,' tells us that in the Book of Landaff there is a passage respecting the pilgrimages to Jerusalem of the three bishops, St. David, St. Teilavus, and St. Paternus, in the fifth and sixth centuries; which passage is most curious, not only with respect to the prelates themselves, but also as giving a very early notice of the use of a clock. It occurs in the life of Teilo, in which, after having stated

that these three bishops were received and entertained with great honour, it is added that, at their departure, "Data sunt eis tria menera pretiosa, prout cuique competebat . . . . . Novissimé autem beato Teilavio, non extremum tamen donorum, accessit *Cimbalum*, magis famosum quam pulchrum; quia dulci sono videtur excellere omne organum. Perjuros damnat, infirmos curat; et quod magis videtur mirabile, *singulis horis, nullo movente*, sonabat; donec peccato hominum præpediente, qui illud pollutis manibus temeré tractabant, a tam dulci obsequio cessavit." Translated from the original MS., this passage runs thus:—"They were presented with three gifts, respectively appropriate . . . . . The last, but not the least, of the gifts was conferred on the blessed Teilo; it was a Bell, greater in fame than in size, and in value than in beauty. It convicts the perjured and cures the infirm; and what seems still more wonderful is, that it *did sound every hour without being touched*, until it was prevented by the sin of men, who rashly handled it with polluted hands, and it ceased from so delightful an office." This bell, which sounded hourly and without being touched, was probably part of a clock; and had it been merely of the clepsydra kind, some of which did strike, as we have mentioned, it might easily have been remedied; whereas this, when once out of order, could not be mended, and therefore it appears to have been wholly mechanical. Roberts says that in the time of Giraldus, Camb., this bell was probably at the church of Glascwm, in Elvein, and called Bangu; but Giraldus states that it had belonged to St. David.

Bœthius is said to have made the first wheel-clock in 510. Stow says that clocks were commanded to be set up in churches in 612. His story is as follows:—"This

yeare, 606, dyed S. Gregory, surnamed the Great, being the third yeere of Focas, 59 Emperoure of the Romanes, and after him Sabinianus succeeded, being the 63 Pope: he commanded clocks and dials to be set up in churches to distinguish the houres of the day." But while reading these statements, we must remember the fact that Alfred the Great, as before recorded, used candles for time-measures about 266 years after the period fixed by Stow for the introduction of clocks. Again, the first clock is said to have been sent by Pope Paul I. to Pepin, King of France, in 756; and we are also told that clocks were first made to strike by the Arabians in 801, and first placed in churches in 913. Rabannus Maurus is said ,to have sent a clock and a bell to a friend about the year 840. The honour of the invention of a wheel-clock is also given to Pacificus, Archdeacon of Verona, who died in the middle of the ninth century. Gerbert, a Benedictine monk of Fleury, afterwards Pope Sylvester II., has similar credit about the year 1000. William of Malmesbury speaks of this prelate's "horologium arte mechanica compositum;" but his claim to the invention of clocks is disputed by Ditmar of Merseburg, who states that the horologe which Gerbert placed in his cathedral was only a kind of sundial.

It is said, but upon doubtful authority, that clocks were known in Geneva in the ninth century, and that the art of manufacturing them was imported there from Germany. The bell or sounding part of the machine was added some time after; and in the eleventh century clocks were not uncommon. However this may be, it seems tolerably certain that the trade of clock and watchmaking in Switzerland is of considerable antiquity; and it has remained until now as a staple branch

of that country's manufactures. In the seventeenth century, some Swiss workmen constructed wooden clocks with weights, after the model of the parish clock which was placed in the church of Locle in the year 1630. But we shall have occasion hereafter to refer to Swiss horology in treating of the curiosities of watches.

It seems that clocks moved by weights and wheels began to be used in the monasteries of Europe about the eleventh century. Writers of this age speak of horologes in such a manner as to show that they were well known, and that their construction was no mystery. Nevertheless in 1108 the sacristan of the monastery of Cluny went out to observe the stars in order to know the time when to awaken the monks to prayer. Alvanus, an old divine, disputing against those who deny the soul's existence, and adducing various arguments in proof thereof, thus deals with one that might be used against him:—"Neither do the motions of those clocks which are moved by water or weights give you uneasiness, both kinds of which move but for a short and moderate time, require frequent repair, and the perfect skill of the astronomer who has a thorough knowledge of his art; but in the bodies of animals and vegetables the motive power is entirely internal, which moderates and regulates the movement of their parts and renders it always perfect." The convenience of clocks, of which for a long time the monasteries were in almost exclusive possession, was gradually appreciated by those who were in civil authority, and public clocks one by one came into use.

William the Sacrist gave to Sherborn in the twelfth century "Orelogium insigne" (Sherborn Cartulary, in the possession of Sir Thomas Phillips); but pro-

bably it was not a wheel-clock. The horologium, or alarum, the fall of which before the hour of matins gave the alarm of the conflagration of the church of Bury, in 1198, as described by Jocelin de Brakelonda, appears by the context to have been a kind of clepsydra.

We now come to a consideration of the first of the wheel-clocks that were seen in England. In the 'Compotus Bracerii' of St. Paul's Cathedral, London, for the year 1286, the allowances to "Bartholomo Orologiario," the clock-keeper, are entered, namely, of bread, at the rate of a loaf daily, for three-quarters of a year and eight days, two hundred and eighty-one panes. And we also find therein an item, "Bartholom' orologi,' post adventum Willielmi de Pikewell, xxiii. bollæ," or bottæ, that is botta, a liquid measure, probably of beer. This tends to show that the Cathedral had a clock at a very early time. The following agreement in unpolished French, dated November 22nd, 1344, was entered into between the Dean and Chapter of St. Paul's, and Walter the "Orgoner," of Southwark, relating to a clock in the church at that time :*—

"Ceste endenture tesmoigne, qe convenuz est parentre le Dean et le Chapitre de leglise de Seint Pool de Londres, dune part, et Wauter Lorgoner de Suthwerke, dautre part, cest assaver, qu le dit Wauter ferra une dyal en lorloge de mesme leglise, od rooss (roues, wheels) et totes maneres de ustimentz appartenantz al dit Dyal, et au tourner del Angel par amunt (par-amont, en haut) lorloge, issint qe le dit Orloge soit bon et covenable et profitable a monstrer les houres de jour et de nuyt a durer sauntz defaute, et en cas qe

* Cottonian Charter, xxi., 24.

defaute soit trove apres ces houres en le dit Orloge, le dit Wauter se oblige par ceste endenture de faire les adresces (repairs) tote foiz, quant il serra garni par les ministres de leglise. Et pur ceste overaigne bien et leument parfaire et acomplir, les avant ditz Dean et Chapitre luy ferront payer sis livres desterlinges, cest assaver, au commencement cessaunt soutz, et quant le Dyal serra prest de mettre sus, trent souz, et a la parfesaunce de tote lovereyne, *cest assaver a la quinzeme de Paske preschein a venir* (interlined), trent soutz. Et le dit Wauter trovera a ses coustages ferre, arresme (airain, brass) et totes manere dautre choses a la dit overeyne parfayre, et avera de vere luy les veuz ustimentz qe ne volunt (valent) plus servir. Et pur cele overeyne faire bien et leument le dit Wauter sei oblige et ses heirs et ses executours et touz ces biens. Et pur seurte de cele overeyne parfayre bien et leument, Nichole Peautrer de Lodegate, Stephene Peautrer del Cunditte, Johanne Barbir, Sergeaunt de mesne leglise, Thomas Barneby, archer sur le Pount de Londres, sount devenuz ses plegges, et soi obligent et lour heirs et lour executours et touz lour biens, ou qilz soient trovetz. En testmoignaunce de quele chose al une partie de ceste endenture de vers le dit Wauter, le dit Dean et le Chapitre unt mis lour seals, a lautre partie de vers eaus lesse, les ditz Wauter, Nichole et Stephene, Johan et Thomas, ount mis lour seals. Done a Loundres, le Samadi le jour de Seint Edmund le Roi et Martire, lan du regne le Roi Edward tierz del conqueste dyssuittime."

In reference to the materials mentioned in this agreement, we may add that iron and steel were used for the wheels and frames of clocks until towards the end of the sixteenth century; and the blacksmiths were in

early times the makers of them, as their materials required heavy forging.

In Dugdale's 'History of St. Paul's Cathedral,' 1658, and in Strype's edition of Stow, reference is made to the dial belonging to the clock there: "Somewhat above the stonework of the steeple, was a fair dial; for which there was order taken in the 18th of Edward III., that it should be made with all splendor imaginable. Which was accordingly done; having the image of an angel pointing to the hour both of the day and night."

It may be concluded that a clock had existed in St. Paul's some time previous to the date of the agreement given above, because Walter was permitted to take for himself the old works (ustiments) then no longer serviceable. Probably the clock, for which he constructed "une dyal," may have previously been one which struck the hours, but was not furnished with a face, a condition that was not uncommon in ancient clocks.

"The clock in old St. Paul's," writes Miss Hackett in 1834, "was struck by figures like those, lately removed, which so much attracted the notice of strangers at St. Dunstan's. This ancient horologe had given name to one of the aisles of the cathedral before the year 1298; and with the exception, perhaps, of one at Canterbury, is the first strictly mechanical timepiece recorded in the annals of clockwork." Evidently the old cathedral had automaton figures, which struck the quarters on the clock; and Decker, in his 'Gull's Hornbook,' calls them "Paul's Jacks." He, writing in 1609, says, "The Great Dial is your last monument; where bestow some half of the three score minutes to observe the sauciness of the Jacks that are above the Man in the Moon there; the strangeness of their motion will quit your labour." And, again, he says, "But

howsoever if Paul's Jacks be once up with their elbows, and quarrelling to strike eleven; as soon as ever the clock has parted them, and ended the fray with his hammer, let not the Duke's gallery contain you any longer."

It seems that it was formerly not uncommon for churches and market houses to have automata to strike the hours, the usual name for which was "Jacks o' th' clock-house," Jack being a contemptuous word for a servile menial. Shakspeare in his 'Richard II.' makes the king say—

> "While I stand fooling here, his Jack o' the clock."

And in the same author's 'Richard III.' is the following passage:—

> "*Buckingham.* Why let it (a clock) strike?
> *King Richard.* Because that, like a Jack, thou keep'st the stroke
> Betwixt the begging and my meditation."

Edward Sharpman in his comedy, 'The Fleire,' thus mentions such an image: "Their tongues are, like a Jack o' th' clock, still in labour."

The building of the present cathedral of St. Paul's was commenced in the year 1675. In a kind of newspaper, called 'The Affairs of the World,' and published in October, 1700, is the following notice: "Mr. Tompion, the famous watchmaker in Fleet Street, is making a clock for St. Paul's Cathedral, which it is said will go one hundred years without winding up; will cost 3,000*l.* or 4,000*l.*, and be far finer than the famous clock at Strasburg." This project was not, however, carried out. The present clock at St. Paul's is remarkable for the magnitude of its wheels, and the fineness of its works. It was made by Lang Bradley in 1708, at a cost of 300*l.* It has two dial plates, one south, and the other

west. Each is between fifty and sixty feet in circumference. One of them was described in 1844 as being the largest in this country that was furnished with a minute-hand. The hour-numerals are a little over two feet in height. The minute-strokes of the dial are about eight inches in length. The minute-hands are about eight or nine feet long, and weigh seventy-five pounds each, and the hour-hands are between five and six feet long, and weigh forty-four pounds each. The pendulum is sixteen feet long, and its bob weighs one hundred and eighty pounds; but it is suspended by a spring no thicker than a shilling. Its beat is two seconds, that is, a dead beat of thirty to a minute instead of sixty. The clock goes eight days, and strikes the hour on the great bell, which is suspended about forty feet from the floor. The hammer lies on the outside brim of the bell, has a large head, weighs one hundred and forty-five pounds, is drawn by a wire at the back part of the clockwork, and falls again by its own weight upon the bell. The clapper weighs one hundred and eighty pounds. The diameter of the bell is ten feet; its weight is about one hundred and two hundredweights, and it is inscribed "Richard Phelps made me, 1716." Below this bell are two smaller ones, on which the clock strikes the quarters. The larger of these weighs twenty-four hundredweights, two quarters, and twenty-five pounds; the smaller, twelve hundredweights, two quarters, and nine pounds.

Mr. T. Reid, in his treatise on clock and watch-making, observes that "Height or length of fall for the clock-weights and sounding-boards for the bells were much attended to when building spires for ancient churches. An instance of this is seen in Sir Christopher Wren's architecture of the cathedral church of St. Paul's, where

the fall for the clock-weights allows of such a force as, by a stroke of a hammer, it can make a bell of 11,474 lbs. be heard at a distance of two-and-twenty miles. We heard it at Windsor in the month of June, 1773. The day was still and calm; and attending to try if the clock could be heard when striking the twelve o'clock hour at noon (which we did hear), the sound which came through the air was not like that of a bell, but had a low, dull, and feeble tone, barely perceivable."

The 'Antiquarian Repertory,' published in 1775, and again in 1807, tells us of a popular tradition, that a soldier who was taxed with having fallen asleep at midnight whilst on guard, managed to escape the punishment following such a dereliction of duty by positively averring, as evidence of his having been wide awake, that he had heard the clock of St. Paul's Cathedral strike thirteen at the very time when it was alleged that he had indulged in slumber. The story is given in Walcott's 'Memorials of Westminster' as being thus recorded in the 'Public Advertiser' of Friday, June 22nd, 1770: "Mr. John Hatfield, who died last Monday at his house in Glasshouse Yard, Aldersgate, aged 102 years, was a soldier in the reign of William and Mary, and the person who was tried and condemned by a court-martial for falling asleep on his duty upon the terrace at Windsor. He absolutely denied the charge against him, and solemnly declared that he heard St. Paul's clock strike thirteen, the truth of which was much doubted by the court, because of the great distance. But whilst he was under sentence of death, an affidavit was made by several persons that the clock actually did strike thirteen instead of twelve; whereupon he received his Majesty's pardon. The above his friends caused to be engraved upon his

plate, to satisfy the world of the truth of a story which has been much doubted, though he had often confirmed it to many gentlemen, and a few days before his death told it to several of his neighbours. He enjoyed his sight and memory to the day of his death." The same story is told in Easton's 'Human Longevity,' 1799; but the age of the soldier is there given as 105. In an anonymous volume of poems, entitled 'Weeds of Parnassus,' by Timothy Scribble, published at Rochester in 1774, we find one called 'A Trip to Windsor,' in which the author says:

> "The terras walk we with surprise behold,
> Of which the guides have oft the story told:
> Hatfield, accused of sleeping on his post,
> Heard Paul's bell sounding or his life had lost."

A writer in 1775, in reference to this circumstance, says, "The first time I heard it was at Windsor, before St. Paul's had a clock, when the soldier's plea was said to be that Tom of Westminster struck thirteen instead of twelve at the hour when he ought to have been relieved. It is not long since a newspaper mentioned the death of one who said he was the man." About the beginning of the eighteenth century the Westminster bell was removed to St. Paul's; and the clock-tower in which the bell was originally placed, and must have been when the sentinel heard it, was removed in 1715.

The reader will remember that the first date which we gave in reference to the clock at St. Paul's was the year 1286. It seems that shortly after that time Westminster also was provided with a public clock. In the sixteenth or seventeenth year of the reign of Edward I., 1288 or 1289, that king found it necessary to prosecute his judges for their corruption and malpractices.

Among the justices who were thus punished was Sir Ralph de Hengham, Chief Justice of the King's Bench, who is said to have been fined seven thousand marks, a very large sum in those days, when the annual salary of a chief justice was only sixty marks. The charge against Hengham, who was a very learned judge, and who wrote two excellent treatises of legal practice, was only, according to a tradition current in the time of Richard III., his altering, out of mere compassion, a fine which was set upon a very poor man, from thirteen shillings and fourpence to six shillings and eightpence, for which he was fined eight hundred marks, a more probable sum than seven thousand. There is an appendix to this tradition, which was remembered by Justice Southcote in the reign of Elizabeth, that with this fine of Hengham a clock-house was built at Westminster, and furnished with a clock that could be heard at Westminster Hall. Strype's Stow says, "Catlyn, Chief Justice of the King's Bench in the reign of Queen Elizabeth, would have ordered a razure of a roll; Southcote, being one of the judges of that court, utterly denied to assent to it, and said openly, that he meant not to build a clock-house."

In the latter half of the fourteenth century, about the year 1365–6, Edward III. caused a clock-tower of stone to be erected at Westminster, in the courtyard opposite the Palace or Hall, before the entry thereto, and near the site of the present-clock tower of the Houses of Parliament. This building contained a clock, which struck every hour on a great bell, to be heard into the hall in sitting-time of the courts, and the same clock in a calm might be heard in the City of London. The tower also contained other large bells, which, as Stow tells us, were "usually rung at coronations,

triumphs, the funerals of princes, and their obits. Of these bells men fabled that their ringing soured all the drink in the town." Hence we may infer that their sound was as doleful as that of Big Ben before he was cracked.

In an Issue Roll of the forty-fourth year of the reign of Edward III., 1371, we find a record of the payment of two pounds, "To John Nicole, keeper of the great clock of the Lord the King, within the Palace at Westminster, taking per day sixpence for his wages for the custody of the clock aforesaid." This was for eighty days, from 24th October to 11th January. Henry IV. also appointed a clockmaker, with a salary, to keep this clock in order. Frequent mention is made of "horologii Regis infra palatium Westm." in the Patent Rolls of Henry V. In the first year of his reign, 1413, are entries relating to the keeper, Hen. Breton, "valectus camere Regis." Among the effects of Henry V., enumerated in 1428, was "j orlage, fait al manere d' un nief, l'argent preis' par estimation, lx*s*."

From accounts of the expenses of maintaining the Westminster clock and the bells in a state of efficiency, for three successive years, namely, the fourth, fifth, and sixth of the reign of Henry VI., it appears that Thomas, a clockmaker, received 13*s*. 4*d*. a-year as his salary for the general superintendence of it; and also 8*s*. for making the sail when it was broken, 6*s*. 8*d*. for amending the spring of the barrel, 12*d*. for the wire of the stobil, and 7*s*. for amending the nut and spindle. He was, moreover, paid for two great ropes, the one weighing fifty-two pounds, and the other forty-nine pounds, at the rate of three halfpence a pound; also for two ropes of thread for the little weight, 2*s*.; and for boards, laths, and mats, which were "bought for to

stop the wind from the said clock, 22*d.*" It is said that Henry VI. gave the keeping of this clock, with the tower, called the clock-house, and the appurtenances, to William Warby, or Walsby, Dean of St. Stephen's, together with sixpence per day remuneration to be received at the exchequer. These items of cost afford us a glimpse of what the old Westminster clock was; and we daresay that it was put up, set agoing, and kept moving, at far less cost and much more expeditiously, than the present clock, whose former silence and immovability have been the subject of many a smart joke. In the Acts of the Privy Council in 6 Henry VI., 1428, are accounts of repairs done to the "orelege," which supply some curious terms of the craft.

In consequence of the imperfections in the construction of the early clocks they were easily deranged; and therefore it became necessary that a custos and setter should be attached to a clock establishment. The orlagere seems to have been the keeper of a clock; but sometimes a clockmaker was so called. In the version of Vegecius, attributed to Trevisa, directions are given for watch and ward when an army is encamped, especially for the out-watch by night, "whiche must be departede in foure quarters of ye nyght, the whiche quarters most be departede by the orlagers."

Shakespeare, who allowed very little to escape his notice, makes Faulconbridge tell King John that Old Time is a clock setter. An excerpt from a manuscript treatise on morals in Lincoln Cathedral shows that the office could be held by a female. "Geloysye salle kepe the orologe, and salle wakkyne the other ladyse and make them arely to ryse," a passage which informs us that horologe-keeping was a responsible situation, and apparently it was not lightly given. At a much later period

this office was held by royal appointment. Queen Elizabeth, Prince Henry, James I., and Charles I., had each her and his clockmaker and clocksetter. Ben Jonson in his Masque of 'Pan's Anniversary,' played before James I. in 1624, makes Fencer say:—"There is annexed a clock-keeper, a grave person as Time himself, who is to see that they all keep time to a nick (or what Shakespeare calls 'a jar o' the clock'), and move every elbow in order, every knee in compass; he is to wind them up, and draw them down, as he sees cause." "Clockmakers and keepers" are named in a list of the artificers who followed the remains of James I. at his funeral in 1625. In the 'Ceremonial d'Espagne' the watchmaker of the court is enumerated as an officer of the household. His pay was eight placas daily, or twenty-nine thousand two hundred maravedis yearly; and he made a separate charge for all work done for his majesty and the household. This was at the latter part of the seventeenth, or the beginning of the eighteenth century.

A writer in 1692 says, "We crossed the Palace yard, on the east end of which lay the relics of Westminster clock-house, in a confused heap." The building had been demolished by the Roundhead mob forty years before. It continued in a ruinous state until 1715, when it was removed, as we have before stated. On the side of New Palace Yard, which was opposite to Westminster Hall, and in the second pediment of the buildings from the Thames, a dial was afterwards inserted with this motto on it, "Discite justiam moniti," which related to the fine imposed on Ralph De Hengham. This dial, according to Speed, seems to have been placed exactly where the clock-house stood. The bell called great Tom of Westminster hung in a strong clock-tower of stone, "over against the great door of Westminster

Hall," says Grose; "and about the beginning of the eighteenth century it was granted to St. Paul's, whither it was removed, and stood under a shed in the churchyard many years before the steeple was cleared of the scaffolding, and fitted for such an ornament." The Westminster clock-house was engraved by Hollar; and it is also represented in the 'Mirror,' vol. xi., p. 369.

It is by many writers said, that the two first clocks known in England were Westminster clock and another at Canterbury; but without doubt the one at St. Paul's preceded both of these. A new great clock for Canterbury Cathedral is mentioned to have been put up in the year 1292, in the time of Henry III., and to have cost 30*l.* Thus, Dart, in his 'History of Canterbury Cathedral,' has given from a manuscript in the Cotton Library the following extract: "Anno 1292, Novum orologium magnum in ecclesiâ (Cantuariensi) pretium 30*l.*" For a new large clock for the church (of Canterbury) the sum of 30*l.* The qualifying word "magnum" here introduced seems to indicate that there were small clocks also used at this period; and it is probable that there then were instances of the private exertion of mechanical genius in constructing horological machines.

In 1316, Prior Henry de Estria bought five bells for Canterbury Cathedral, whereof one, weighing 8,000 pounds, was called Bell Thomas, and was placed in the great clock-house. Three others were set up in a new long clock-house built about that time. Somner, in his 'Antiquities of Canterbury,' 1640, makes no mention of so early a clock as that named above being at that city. He is very elaborate and exact in his statements, and therefore it is noticeable that if such a clock had been erected there the fact escaped his attention. But he records that William Benet, who was mayor of Can-

terbury in 1450, and who had been various times before one of the bailiffs of that city, by his will gave to the parson and wardens of St. Andrew's church there 4*s.* 4*d.* per annum, to keep and maintain the clock for ever. This incident shows that the public utility of clocks began to be appreciated at that time. The fate of the clock at St. Andrew's does not appear; but we find that several parishioners of Canterbury bequeathed money at the end of the fifteenth century for the making of a new steeple to that church, the whole of which building was pulled down about the year 1764. The gift of a clock to a church was anciently deemed to be a most important benefaction.

The time when clocks were rendered portable cannot be precisely determined. Before such ones could be made, the substitution of the main spring for a weight, as the moving power, must have taken place. The first distinct mention of a clock as a piece of household furniture occurs in a poem, entitled the 'Romaunt de la Rose,' written by Jean de Meum about the year 1305, in which certain hall and chamber striking clocks are named as "ringing again," and driven by wheel-work:

"Et puis fait sonner ses orloges
Par ses salles et par ses loges,
A roes trop subtillement
De pardurable mouvement."

Which has been thus translated:

"And then he made his clocks strike
In his halls and in his chambers,
With wheels very subtily contrived
With a continuing movement."

In a metrical romance of Sir Degrevant, preserved among the manuscripts in the public library of Cam-

bridge, there is a passage describing a chamber, which was furnished

> "With an ovrelegge one hyzth,
> To rynge the ours at nyzth,
> To waken Myldore the bryzth,
> With bellus to knylle."

In an illuminated manuscript in the British Museum, entitled 'L'Orloge de Sapiensse,' attributed to De Sonabe, a German Jacobin, born in 1300, is a drawing of a curious clock, which is in some degree portable. And another manuscript in the same museum, of the middle of the fourteenth century, gives a drawing of a clock with weights and a large bell and hammer at the top. Willemin has an engraving of a chamber-clock hanging against the wall, and having graduated Gothic buttresses on each side, and a dome at the top for the bell; and from beneath it appear the strings and weights in the manner of those which are now called Dutch clocks. This he has taken from a painting by John of Bruges, in a manuscript of the fifteenth century, entitled the 'Romance of Renaud De Montauban.' Shaw, in his 'Dresses and Decorations,' has copied it. A similar one was in the tapestry of the time of Edward IV. which hung in the painted chamber in the palace of Westminster. A manuscript in the Bodleian Library, dated 1450, gives two drawings of portable clocks. Such an instrument is evidently alluded to in a letter written by Sir John Paston in the year 1469. He writes: "I praye you speke w^{t} Harcourte off the abbeye ffor a lytell clokke whyche I sent him by James Gressham to amend, at y^{t} ye woll get it off hym an it be redy, and sende it me, and as ffor mony for his labor, he hathe another clok off myn whyche S^{r} Thoms Lyndes, God have hys sowle, gave me. He maye kepe

that tyll I paye him. This klok is my Lordys Archebysshopis, but late not him wote of it."

In a work entitled 'Interesting Papers relating to the History of France from the Time of Louis XI. to that of Louis XVIII.,' is the following entry of the former period, April 4th, 1480: "To John of Paris, clock maker, the sum of 16*l.* 0*s.* 10*d.*, ordered for him by the said lord in the month of March, for a clock which has a dial-plate, and which sounds the hours, garnished with all that appertains to it, and which the said lord caused to be taken and bought, that he might carry it with him to every place whither he might go."

The Society of Antiquaries of England is in possession of one of the oldest of these portable clocks in this country in a perfect state. It was presented to them in the year 1808 by Henry Peckett, of Compton Street, Soho, having been purchased by him in 1777. The following inscription in Bohemian, on the barrel of the clock, records that it was made in the year 1525 by Jacob Zech:

"Iar. da. Mahcht Mich Iacob Zech zv Prag Ist Bar Daman zalt 1525.

"Year when made me Jacob Zech at Prague is true when counted 1525."

It was originally made for Sigismund I., King of Poland, and presented by him to Bona Sforzalus. The body is enclosed in a circular case or box of gilt brass, measuring nine inches and three-quarters in diameter by five inches in height. Both the design and the workmanship of this case are in excellent taste, and the bold foliated decorations around its sides are finely finished. This astronomical clock has armorial bearings, and a dial on the upper surface.

There is a curious clock still to be seen in the north

tower of Exeter Cathedral, which is stated to have been presented by Bishop Courtenay in 1480; but it is certain that a clock existed there much earlier than that time; for we find in the patent rolls of the eleventh year of the reign of Edward II., 1318, a grant to Rob. Fitzwalter of lands in Pennington for the service of repairing the organ and the clock in the cathedral of Exeter: "R. concess. Rob. Fitz Walter tenem. in Pennington pro servitio pulsandi campanas et reparandi organa et horologia in eccles. Exon." In the present clock the earth is represented by a globe in the centre, and the sun by a fleur-de-lis, which, as it daily revolves round the earth, points out the hours; while a ball, painted black and white, represents the moon's phases by turning on its axis. In 1760 some additional works were added to this clock to show the minutes. Under it are inscribed these words, "Pereunt et Imputantur sc. horæ."

Striking clocks were not uncommon in Italy in the early part of the fourteenth century; they were also wheeled clocks, for Dante, who was born in 1265 and died in 1321, compares the circling dance of the rejoicing spirits in Paradise to the admonitions of a clock:

> "Thence as the clock which chimed
> At the hour that the spouse of Idio rose."

Or, according to Wright, another translator:

> "Then like a clock that summons us away;
> What time the spouse of God, at matin hour,
> Hastes to her husband, for his love to pray;
> And one part urges on the other, sounding
> Tin, tin, in notes so sweet, that by its power
> The soul is thrilled, with pious love abounding.
> So I beheld that glorious circle move,
> And with such sweet accord and harmony,
> Take up the song of praise, as none can prove,
> Save where is joy through all eternity."

Numerous notices of clocks are contained in the Sacrist's Rolls preserved among the archives of the Dean and Chapter at Norwich. The earliest is in 1332:—"Horolog'.—In uno plate de metallo empto iv. *d.* ob., in sound' empto xvi. *d.* in factura v. ymaginum xx. *s.* Item, garcioni facienti capit' iij. *s.* In stipendiis magistri Roberti xx. *s.*" Andrew and Roger, carpenters, are also mentioned as having been employed at this period. The total of the expenditure between Michaelmas and Christmas amounted to 4*l.* 19*s.* 8½*d.* In the Compotus of 1323 and of 1325, many entries occur under the head Orologium. It appears that this orologium was an elaborate piece of mechanism, furnished with many painted images, which no doubt performed curious evolutions. There was a set of twenty-four small images, the work of Master Adam, the sculptor, probably personating the hours of the day and night. There were also thirty images, doubtless representing the days of the month; and painted and gilded plates portraying the sun and moon. A painted procession of monks formed part of the mechanical pageantry. A large metal plate for the dial was procured from London, apparently with some difficulty, numerous messages having been despatched there relating to it by various garciones. This plate, which weighed eighty-seven pounds, was evidently a complicated and very elaborately engraved work. The construction was attended with many difficulties; Master Robert de Turri failed in the attempt, and two artificers from London who succeeded him were also unsuccessful. The works appear to have been in progress during three years, and besides the cost of iron work, brass, copper, and "latoun," a considerable sum was expended in carpenter's work, decorations in colours,

enriched with gold and silver leaf, and other things. Two hundred pieces of Caen stone and ten of Gobetz stone were used, probably for the base on which the clock was fixed.

That clocks were in use in England at this time may be readily inferred from a couplet by Chaucer, who was born in 1328 and died in 1400, and who, alluding to the cock, says:—

> "Full sikerer was his crowing in his loge
> Than his a clock or any abbey orologe."
> Full surer (or as certain) was his crowing in his roosting place
> As a bell (regularly tolled) or an abbey clock.

Almost all the monasteries throughout the country had a clock when Chaucer wrote, namely, at the close of the fourteenth century.

St. Alban's Abbey was for several centuries possessed of a fine astronomical clock, which was made at great cost, and with superior skill and ingenuity, by Richard de Wallingford, the son of a blacksmith of that town, who attained to great proficiency in science at Oxford, and in after-times, for his learning, was made abbot of St. Alban's (1326–1334). This clock appears to have been in going order in the time of Henry VIII., when it is mentioned by Leland ('Treatise de Scriptoribus Britannicis'), who saw it, and described it as follows:— "Cùm jam per amplas licebat fortunas, voluit illustri aliquo opere non modò ingenii, verùm etiam eruditionis, ac artis excellentis, miraculum ostendere. Ergo talem horologii fabricam, magno labore, majore sumptu, arte verò maximâ, compegit, qualem non habet tota Europa meâ opinione secundum; sive quis cursum solis ac lunæ, seu fixa sidera notet, sive iterum maris incrementa et decrementa." Without doubt Leland was right when

he expressed his opinion that such a clock as this one existed nowhere else in Europe. It was a miracle of art, and by it were noted the course of the sun and moon, the rising and setting of the planets and fixed stars, the ebb and flow of the tide, and in short, the figures, operations, and effects of all the heavenly bodies. When the abbot supposed his life to be drawing to a close, he wrote a book of directions for keeping this piece of mechanism in order: "Ne tam insignis machina vilesceret errore monachorum, aut incognito structuræ ordine silesceret," so that it might not become deranged by the careless or inexperienced monks in after-times. "This machine," says Leland, "if I remember right, was called by the inventor 'Albion' (all by one)." But probably it was named in honour of the patron saint of the monastery, whose name was anciently spelt Albone. It is said that the abbot had begun early in life to construct this clock, and then neglected it; but he resumed his work through the encouragement of Edward III. given by him when at the abbey on a visit. The royal exhortation made the abbot very diligent in the execution, for he would say, "Though the abbey wants repairs, my successors may be able to build walls and mend tilings, but none, I believe, except myself, can ever finish this clock." However, it is said that it was completed by Laurence Stokes, in the time of Abbot de la Mere, 1350–1396. Representations of the maker (who died on June 10th, 1334) and of his clock may be seen in Cott. MSS. Claud E. iv. and Nero, D. vii., and it is referred to in Newcome's 'History of St. Alban's,' p. 230, and Clutterbuck's 'History of Hertfordshire,' vol. i., p. 28.

Courtray possessed a famous clock, which struck the hours, and was remarkable for its mechanism; but this

fine instrument excited the cupidity of a military conqueror, and, as Froissart tells us, during the year 1332, Philipe le Hardi, Duke of Burgundy, carried it away, and set it up in the town of Dijon, in his own duchy.

A public clock was erected at Padua in the first half of the fourteenth century (the dates are variously given, 1334, 1344, and 1350), at the expense of Hubert, Prince of Carrara. "He caused," says an old writer, "to be built at the top of the tower a clock, in which during day and night the twenty-four hours pointed themselves out." It is stated to have been made by John de Dondis, who was more frequently distinguished by the appellation of Maitre Jehan des Orloges, an astronomer in the service of Galeazzo Visconti, Count of Vertus. Dondis invented a moving sphere, or celestial clock, which was regarded as the wonder of his age. It was composed of an infinite number of circles and wheels, governed by a single balance, and preserved such a regular motion, that at any hour of the day or night the different points of space occupied by the celestial bodies might be distinguished. It was made of copper; and Dondis, who was no less skilful as a mechanic than as an astronomer, employed twenty years in bringing it to perfection. His family went by the name of Horologius or Horologia.

One of the oldest clocks of English manufacture now in existence was made about the year 1335 (some say 1340) by Peter Lightfoot, an ingenious monk, of Glastonbury Abbey, for and at the expense of his superior, Adam de Sodbury, who was promoted to the Abbacy of Glastonbury in 1322, and died in 1335. This ancient and complicated piece of machinery was, according to William of Worcester, originally in the south transept of the abbey church; but it was removed

with all its appendages from thence to Wells Cathedral at the time of the dissolution of the monastery in the reign of Henry VIII., where in an old chapel in the north transept it still remains. The face of the dial is six feet six inches in diameter, and contained in a square frame, the spandrils of which are filled with angels holding in their hands the head of a man. The outer circle is painted blue, with gilt stars scattered over it, and is divided into twenty-four parts, corresponding with the twenty-four hours of the day and night, in two divisions of twelve hours each. The horary numbers are painted in old English characters on circular tablets, and mark the hours from twelve at noon to midnight, and from thence to twelve at midday again. The hour-index, a large gilt star, is attached to the machinery behind a second circle, which conceals all except the index. On this second circle are marked the minutes, indicated by a smaller star. A third and lesser circle contains the number of the day of the month, which is marked by a point attached to a small circular opening in the plate, through which the phases of the moon are shown. Around this aperture is an inscription, not very intelligible, which one author reads as "Ab hinc monstrat micro . . . . ericus archery pung," meaning probably that in this microcosm were displayed all the wonders of the vast sidereal hemisphere. But later authors are of opinion that the inscription is an hexameter verse, and although to explain it completely may be difficult, they read it thus:—"Punctus ab hinc monstrat micro sidericus arcus." It is then only the word micro which is unintelligible, and that may be incorrectly deciphered. On the opposite side of the dial-plate is a circle, in which is a female figure, with the motto "Semper

peragrat Phœbe." An arched pediment surmounts the whole, with an octangular projection from its base line, forming a cornice to the face of the clock. A panelled turret is fixed in the centre, around which four equestrian knights, equipped for a tournament and mounted on two pieces of carved wood, revolve in opposite directions rapidly round a centre, two on each side, as if running at the ring in a tilt, when set in motion by a connection with the clock, which can be done at pleasure. A man seated at one angle of the transept, within the church, is connected by rods with the clock, and he is made to strike the quarters with his feet on two little bells, and the hours on another bell before him with a battle-axe that is in his hands. If the date of the construction of this clock be correct, the figures at present moved by its machinery cannot, according to Mr. Planché, be the original ones, or they have undergone strange alteration. Those that circulate in a sort of tilting match are very clumsily carved, and have suffered some injury from time; but two of them appear to be intended for jesters; one wears a hood with ears to it. The third is a nondescript; but the fourth is painted in the civil costume of the reign of James or Charles I., with falling collar, striped doublet, and the peaked beard and moustache of that period. The two figures that strike the bell on the outside with their battle-axes are in armour of the fifteenth century, and the time of Henry VI. or Edward IV.

The old interior works of this clock were of iron and brass, not differing materially in principle from the mechanism of later clocks, except that the appliances for the variety of the movements of the dial-plate were necessarily complicated. They exhibited a rare and interesting specimen of the art of clockmaking at so

early a period, in which the monks particularly excelled. After going for nearly five centuries, the works were found to be so completely worn out, that about the year 1835 they were replaced by a new train, made by Thwaites and Reid, of Clerkenwell. The curious old face or dial-plate and the antique figures of the knights on horseback were carefully adapted to the new body, and the latter still may be seen tilting as of old. Phelps gives a coloured engraving of this clock in his 'History of Somersetshire,' vol. ii., p. 66; it is also depicted in Warner's 'History of Glastonbury,' pl. ix.; and there is an account of it in Collinson's 'History of Somerset,' vol. ii., p. 254, vol. iii., p. 399; and in the 'Gentleman's Magazine,' vol. xcvi., part 2, p. 399; and in the same magazine, 1830, vol. c., part 2, p. 632.

About the year 1340, Dafydd ap Gwvilym, a famous Welsh bard, thus abuses a clock for disturbing him in a delicious dream:—"Confusion to the black-faced clock by the side of the bank that awoke me! May its head, its tongue, its pair of ropes, and its wheels moulder; likewise its weights of dullard balls, its orifices, its hammer, its duck's quacking as if anticipating day, and its ever restless works. This turbulent clock clacks ridiculous sounds, like a drunken cobbler —a cobbler, too, in appearance. Cunning and false-blind gut! The yelping of a dog in a pan echoed! The ceaseless chatter of a cloister? A gloomy mill grinding away the night!"

About the time when the foregoing was written, Froissart, then a youthful poet, composed his 'Horologe Amoureuse.' In this poem, which is one of the earliest of his productions, he makes some highly complimentary allusions to a clock, some of which are translated thus:—

"The clock is, if rightly considered,
A machine very fair and very famous,
And it is also pleasant and profitable;
For night and day it shows us the hours;
By the subtilty it comprises,
In the absence even of the sun,
On which account we ought the more to prize it,
Which other instruments do not do,
However they may be made by art and by compass;
Therefore I hold him for valiant and wise
Who first found the use of it;
When by his sense he began and made
A thing so noble and of such great profit."

There is now at Dover Castle, nearly entire, an unsophisticated old timepiece, bearing the date of the year 1348, and the initials R. L., united as a monogram.

CHAPTER II.

Strasburg Cathedral Clock — Mechanical Performances of — Ratisbon Clocks — Genoa Clock — Bologna Clock — Charles V.'s Clock at Paris — Montargis Clock — Sens Clock — Edward III. and the Dutch Clockmakers — His Charter to them — Spire Clock — Clocks mentioned in Early Records in British Museum — Seville Clock — Walberswick Clock — Nuremberg Clock — Clocks at St. Mary's, Oxford — Auxerre Clock — Dunstable Priory Clock — Clocks first used for Astronomical purposes — Wigtoft Clock — Venice Clock — Prague Clock — Cardinal Wolsey's Clock — Clock at St. Mary's Priory, Huntingdon — Nuremberg Clocks — Henry VIII.'s Clocks — Anne Boleyn's Clock — Clocks at the Palace at Westminster in 1542 — Longitude Clock proposed — Sir Thomas More's Clock — Dale Abbey Clock — Hampton Court Palace Clock — Verses thereon — Clock going Twelve Months — Clock going One Hundred Years — Clock found near Royston — Paris Clockmakers chartered — Clock of St. Margaret's, Westminster — Edward VI.'s Clockmaker — His gift of a Clock to Sir John Cheke — Gifts of Clocks to Queen Mary — Tycho Brahe's Clock — Table Clocks — Archbishop Parker's Clock — Earl of Leicester's Clock at Kenilworth — Moestlin Clock — Valenciennes Clocks — Perpetual Clepsydra projected — Discovery of the Pendulum — Galileo — Christian Huygens — Richard Harris — John Fromentel — Huygens' Clock — Rudolph II.'s Clock — Lambeth Clock — Bartholomew Newsam, Queen Elizabeth's Clockmaker — Curious Clock at Whitehall Palace — Bequests of Clocks — Clock at Glastonbury — Earl of Essex's Clock — Curious Mechanical Clock of Pope Sixtus V. and William I. — Lubeck Clock — German Clocks — Whimsicalities of — Augsburg Clocks — Foreign Clocks in South Kensington Museum — Great Wigston Clock — Clock at St. John's Cathedral, Lyons — Shakespeare and Clocks.

AT Strasburg Cathedral, in France (which town was celebrated for having extended the art of clockwork beyond the mere record of the hours of the day), is a famous astronomical clock, about twenty feet high, which is a most ingenious, elaborate, and exquisite piece of mechanical art. This monster clock was preceded by another of similar extraordinary work-

manship, that was begun in 1352, and was placed in the tower of the cathedral in 1370. It is said that the only existing portion of the original clock is a cock, upon the left perpendicular ornament of the machine, which, upon the hourly chiming of the bells, used from the time of its construction to flap its wings, stretch out its neck, and crow several times. The present clock was remodelled from the first one by Conradus Dasypodius, Professor of Mathematics at Strasburg, who began his labours on it in 1571, and replaced the clock complete in the south transept of the cathedral in 1574. He appears to have taken several journeys to employ and to consult with the most clever workmen in Germany about this clock, the wheels and movements of which were made by the two Habrechts, natives of Schaffhausen. In 1580 he published, in thin quarto, his treatise, 'Horologii Astronomici argentorati in summo Templo erecti descriptio.'

It is related that the original artisan of the clock became blind before he had completed his work, but that he finished it notwithstanding his infirmity. Inglis, in his 'Tyrol,' says:—"There is a curious circumstance connected with the clock in Strasburg Cathedral, it is of very complicated and delicate workmanship, and the artisan who contrived and made it becoming blind before he had terminated his labour, it became a question of some difficulty and of much importance how the work was to be completed; the public authorities engaged other mechanics, but they being ignorant of the design upon which the whole was meant to be constructed, were unable to proceed, and the blind artisan, anxious to reap all the honour himself, not willing that others should have the credit of finishing that which their genius could not have

enabled them to begin, refused to communicate any information, but offered to complete the work, blind as he was; and this very wonderful and ingenious piece of mechanism now remains not only a monument of the genius of the maker, but a curious illustration of the power of habit as well as of the acuteness communicated to one sense by the deprivation of another."

The movements of this clock have been thus described :—" Herein nine things are to be considered, whereof eight are in the wall; the ninth (and that the most wonderful) stands on the ground three feet from the wall. This is a great globe of the heavens, perfectly described, in which are three motions: one, of the great globe, which displays the whole heavens, and moves about from the east to the west in twenty-four hours; the second is of the sun, which runs through the signs there described once every year; the third is of the moon, which runs her course in twenty-eight days. So that in this globe you may view the motions of the whole heavens, the motions of the sun and moon, every minute of an hour, the rising and falling of every star (amongst which stars are the makers of this work, Dassipodius and Wolkinstenius) described. The instruments of these motions are hid in the body of a pelican, which is portraited under the globe. The pole is lifted up to the elevation of Strasburg, and noted by a fair star made of brass; the zenith is declared by an angel placed in the midst of the meridian. The second thing to be observed (which is the first on the wall) are two great circles one within another, the one eight feet, the other nine feet broad; the outmost moves from the north to the south once in a year, and hath two angels, one on the north side, which points every

day in the week; the other on the south side, which points what day shall be one half-year after. The inner circle moves from south to north once in a hundred years, and hath many things described about it; as the year of the world, the year of our Lord, the circle of the sun, the progressions of equinoctials, with the change of the celestial points, which things fall out by the motions which are called trepidations; the leap-year, the movable feasts, and the dominical letter, or golden number, as it turns every year. There is an immovable index, which encloses for every year all these things within it; the lower part of which index is joined to another round circle which is immovable, wherein the province of Alsatia is fairly described, and the city of Strasburg. On both sides of the circles, on the wall, the eclipses of the sun and moon are, which are to come for many years, even so many as the wall might contain. The third thing, a little above this, is a weekly motion of the planets, as they name the day; as on Sunday, the sun is drawn about in his chariot, accordingly as the day is spent; and so drawn into another place, that before he be full in, you have Monday; that is the moon clear forth, and the horses of Mars' chariot putting forth their heads; and so it is for every day in the week. On this side there are nothing but dumb pictures to garnish the wall. The fourth thing is a dial for the minutes of the hour, so that you see every minute pass. Two beautiful pictures of two children are joined to either side of this; he on the north side hath a sceptre in his hand, and when the clock strikes, he orderly tells every stroke; he on the south side hath an hour-glass in his hand, which runs just with the clock, and when the clock hath struck, he turns his glass. The first thing above the

minute-dial is a dial for the hour, containing the half-parts also; the outermost circumference contains the hours; but within it is a curious and perfect astrolabe, whereby is shown the motion of every planet, his aspect, and in what sign, what degree, and what hour, every one is in every hour of the day; the opposition likewise of the sun and moon, and the head and tail of the dragon. And because the night darkens not the sun, nor the day the moon, or other planets, therefore their courses are here exactly seen at all times. The sixth thing is a circle, wherein are the two signs of the moon's rising and falling; at two hollow places it is seen at what state she is; and her age is declared by an index, which is wholly turned about once in every month. The seventh thing consists of four little bells, whereon the quarters of the hour are struck; at the first quarter comes forth a little boy, and strikes the first bell with an apple, and so goes and stays at the fourth bell until the next quarter; then comes a lusty youth, and he with a dart strikes two bells, and succeeds into the place of the child; at the third comes forth a man-in-arms, with a halbert in his hand, and strikes three bells; he succeeds into the place of the youth; at the fourth quarter, comes an old man with a staff, having a crook at the end; and he with much ado, being old, strikes the four bells, and stands at the fourth quarter, until the next quarter; immediately to strike the clock comes Death in a room above the others, for this is the eighth thing; and this, understand, that at each quarter he comes forth to catch each of those former ages away with him; but at the contrary side, in the same room where he is, comes forth Christ and drives him in; but when the last quarter is heard, Christ gives him leave to go to the

bell, which is in the midst, and so he strikes with his bone, according to the hour; and he stands at the bell, as the old man doth at his quarter-bell, till the next quarter, and then they go in both together. The ninth and last thing in this right line is the tower at the top of the work, wherein is a noble, pleasant chime, which goes at three, seven, and eleven o'clock, each time a different tune; and at Christmas, Easter, and Whitsuntide, a thanksgiving unto Christ; and when this chime has done, the cock (which stands on the top of the tower, and the north side of the main work), having stretched out his neck, shook his comb, and clapped his wings twice, crows twice, and this he doth so shrill and naturally, as would make any man wonder; and if they choose who attend the clock, they can make him crow more times. In this tower are conveyed all the instruments of these motions, which are in the aforesaid things."

Another description, which gives some further details of this clock, is as follows:—"Before the clock stands a globe on the ground, showing the motions of the heavens, stars, and planets. The heavens are carried about by the first mover in twenty-four hours. Saturn, by its proper motion, is carried about in thirty years. Jupiter, in twelve; Mars, in two; the Sun, Mercury, and Venus, in one year; and the Moon in one month. In the clock itself are two tables on the right and left hand, showing the eclipses of the sun and moon for the year 1573 to 1624. The third table in the middle is divided into two parts. In the first part the statues of Apollo and Diana show the course of the year and the day thereof, being carried about one year. The second part shows the year of our Lord, and the equinoctial days, the hours of each day, and the minutes of each hour,

Easter-day, and all the other feasts, and the dominical letter; and the third part hath the geographical description of all Germany, and particularly of Strasburg, and the names of the inventor and the workmen. In the middle frame of the clock is an astrolabe, showing the sign in which each planet is every day; and there are statues of the seven planets upon a circular plate of iron; so that every day the planet that rules the day comes forth, the rest being hid within the frames till they come out of course at their day, as the sun upon Sunday, and so for all the week. There is a terrestrial globe, which shows the quarter, the half-hour, and the minutes. There is a figure of a human skull, and statues of two boys, whereof one turns the hour-glass when the clock hath struck, and the other puts forth the rod in his hand at each stroke of the clock. Moreover, there are statues of Spring, Summer, Autumn, and Winter, and many observations of the moon. In the upper part of the clock are four old men's statues, which strike the quarters of the hour. The statue of Death comes out at each quarter to strike, but is driven back by the statue of Christ, with a spear in his hand, for three quarters; but in the fourth quarter Death strikes the hour with the bone in his hand, and then the chimes sound. On the top of the clock is the image of a cock, which twice in a day crows aloud and claps his wings. Besides, this clock is decked with many rare pictures, and being on the inside of the church, carries another frame to the outside of the walls, whereon the hours of the sun, the courses of the moon, the length of the day, and such other things are set out with much art."

In 1617 was published at Strasburg, quarto, in German, a description of the cathedral and clock

of that city. In one or more of the years 1625, 1630, and 1640, for the dates are variously given, the latter was struck by lightning, after which it remained for a long time out of going order. Dr. Dibdin, who saw it in 1818, says it was then wholly out of order. In the second quarter of the present century it was repaired, after about fifty years' uselessness, by J. B. Schwilgue, a watchmaker of Strasburg, who laboured four years upon it, namely, from 1838 to 1842. The cockcrow, which had been mute since 1789, was reproduced; and mechanism added by which at midnight, on December 31st, the movable feasts ranged themselves in the calendar, and in the succession they would appear in during the next year. In 1843 this clock was exhibited to the Scientific Congress held at Strasburg, and it excited considerable interest. Forbes, in his 'Physician's Holiday,' 1852, in reference to Strasburg Cathedral, says: "We did not fail, of course, to attend at twelve o'clock, to witness the wonderful performance of the famous clock, which is certainly a very ingenious piece of mechanism, but rather too ludicrous in its effect for its solemn locality. A great crowd was collected to see the show and hear the cock, which crowed marvellously well for a bird whose lungs are a pair of bellows." The clock is represented in the 'Mirror,' 1824, vol. iii., p. 209; and in the 'Illustrated London News,' January 28th, 1843; and several engravings of it have been published at Strasburg.

In the hall of the Princes' College at Ratisbon, in 1731, stood a clock, made after the model of the one in Strasburg Cathedral. The quarters were struck by several figures; and every hour the three kings made their appearance and paid their adoration to the Virgin Mary and her Son, while the cock that was placed over

them crowed. Upon one of the four sides of an old, short, square Gothic tower in Ratisbon is a curious ancient clock, supported by human figures.

John Visconti, Archbishop of Milan, set up a clock at Genoa in 1353. It is supposed to have been a spring or wheel clock, and made after the pattern of that of Padua before mentioned by us. The first clock at Bologna was fixed up in 1356. About the year 1364 or 1370 (probably the latter), Charles V. of France caused a great striking clock to be placed in the tower of his palace, by Henry de Vick (some say Charles de Wyck), a clockmaker whom he invited from Germany, because there was no artist of the kind in Paris. The principles upon which this clock was constructed were mainly the same as those of the clocks of this day; there was a moving and also a regulating power. The former was a weight hung to a cord, wound round a barrel, the unwinding of which by the fall of the weight gave motion to a train of wheels that moved the hands round the dial. The regulating power was a balance-wheel, swinging backwards and forwards after the manner of the watch-balance. The maker appears to have been an ingenious man, who combined into one machine the inventions of the past time. The Tour de l'Horloge of the Palais de Justice, Paris, contains this famous clock, which was the first of the kind that the Parisians had seen. Charles V. appointed an officer, with a salary, to keep this machine in order. A little time after this clock was constructed another was made by a Frenchman, and put up at Montargis, with the following inscription:—"Charles le Quint me fit par Jean de Jouvence," Charles the Fifth caused me to be made by Jean of Jouvence. Some years after another clock was put up at the cathedral of Sens, when the

king paid one-half of the expense of a wooden case in which it was enclosed.

In 1368, Edward III., who, judging from his acts, had a liking for mechanical art, invited over from Delft to England three Dutch clockmakers, to whom he granted, by his letters patent, in the forty-second year of his reign, safe conduct and protection for one year to carry on, for their own profit, their lawful employment. Rymer, in his 'Feodara,' gives a copy of this document as follows:—

"A. D. 1368. An. 42, E. 3. Pat. 42. E. 3, p. 1, M. 15.

"Rex omnibus Ballivis & Fidelibus suis, tàm infra Libertates, quàm extra, ad quos &c. Salutem.

"Sciatis quòd suscepimus in Protectionem & Defensionem nostram, nec non in salvum & securum Conductum nostrum, Johannem Unenam, Willielmum Uneman (*sic*), & Johannem Lietuyt, de Delft, Orlogiers, veniendo in Regnum nostrum, Artificio suo prædicto in eodem Regno utendo;

"Et ideò vobis mandamus quòd ipsos, Johannem, Willielmum, & Johannem, infra Districtus vestros veniendo, & Artificio suo prædicto utendo, Manuteneatis, Protegatis & Defendatis, non inferentes eis, vel, quantum in vobis est, ab aliis inferri permittentes in Personis, Bonis, & Rebus suis quibuscumque, Injuriam, Molestiam, Violentiam, Dampnum, aut Gravamen:

"Et, si quid eis forisfactum vel injuriatum fuerit, id eis sine dilatione debitè corrigi & reformari faciatis; ita tamen quòd prædicti, Johannes, Willielmus, & Johannes, erga Nos & Populum nostrum, benè & fideliter se gerant, & Artificio Bono & Legali perutantur. In cujus, &c., per unum Annum duraturas.

"Teste Rege apud Westmonasterium quarto die Maii."

No doubt the king found it necessary to invite skilled artificers from abroad, in consequence of clocks coming into general use, and of the paucity of good native workmen, and of there being many mere pretenders to the art of clockmaking.

Lehmann informs us that there was a clock at Spire in 1395.

In certain early documents preserved in the British Museum, clocks are mentioned as follows: Under date May 13th, 1396, Jehan de Menelix, master of the works to the Duke of Orleans, certified that Thinoman Rogeret, "constellier et ouvrier de forge," had made "le Reloige (Horloge) de Chasteauneuf, cestassavoir, les mouvemens, roes et roez, et apparten' au dit Reloige, excepté la Cloiche," for the sum of thirty-six gold crowns. Under date December, 1396, Pierre le Queux, "Orlaugeur," acknowledged the receipt of thirty gold crowns, at eighteen solz each, from Godeffroy le Fevre, valet of the chamber of the Duke of Orleans, "pour la vente de trois Auloiges." Under date October 7th, 1397, Robert Dorigny, "fevre," acknowledged the receipt of nine livres tournois "pour avoir descendi et mis par membres le mouvement de l'orloge qui estoit en l'ostel de Mons. le Duc à Asnière, et ycellui conduit et fait admener à ses fraiz à Villers Costeret," by order of the Duchess. Under date August 9th, 1401, Jehan Dalemaige, "serrurier," of Paris, acknowledged the receipt of sixty-six sols Paris, from the receiver of the finances of the Duchess of Orleans, "pour un mouvement ou petite Orloge achaté de lui pour mettre en la chambre de ma dite Dame." Under date December 19th, 1407, Jehan Liebourc, "faiseur d'Orloges," at Paris, acknowledged the receipt of fifty-five solz tournois from the receiver-general of the Conte d'Angoulesme, "pour deux roes et autres choses par lui mises pour l'Orloge de mon dit Seigneur."

The first clock seen in Spain was set up in the cathedral of Seville in 1400. Carpentier, in his supplement to Du Cange, cites a decision of the Parliament of Paris

in 1413, in which Henry Bye, one of the parties, is styled "Horologiatoris et custodis seu gubernatoris horologii palatii nostri Parisius."

By the churchwardens' accounts for Walberswick, Suffolk, we find that in 1451, the sum of eleven pence was "Payd to the clock maker;" and in the next following year the sum of 12*s.* 8*d.* was also paid to him. In 1495 the churchwardens "Payd John Payn, of Southwold, the smyth, for a new cloke, 6*s.* 8*d.*." This item interestingly illustrates the cost of early clocks, and shows that a smith was the seller of the one in question. The works of early clocks were generally forged by smiths, who were in fact the clockmakers of that day. Probably the Walberswick clock, that cost only 6*s.* 8*d.*, was an inferior one, and soon got out of order, for we find that the churchwardens in 1499 "Payd to Nicholas Schrebbys for the cloke" the several sums of 1*l.* 13*s.* 4*d.*, 6*s.* 8*d.*, 1*l.* 2*s.*, and 13*s.* 4*d.*

Nürnberg or Nuremberg had a clock in 1462.

The will of John Baret, of Bury St. Edmund's, dated in 1463, contains the following bequest:—"Itm, I wil yeve and be qwethe yeerly to the Sexteyn of Seynt Marie chirche viij*s.* to keep the clokke, take hede to the chymes, wynde vp the peys and the plummys as ofte as nede is." The "peys and the plummys" were the greater and lesser weights (the latter being probably formed of lead), from the French poids and plombs.

In the Proctors' Accounts for 1469 of St. Mary's, at Oxford, is this item:—"Pro custodia horilogij, vj*s.* viij*d.*" And in 1473, "Pro custodia horilogij, iiij*s.*" In 1523, St. Mary's was furnished with a clock, out of fines imposed on the negligent students of that university. In the Vice-Chancellor's accounts from 1550 to 1554 is an item of 1*l.* 14*s.*, paid to Thomas Masey "for mendinge

of St. Maryes clocke, 25 Junii, travellinge (working) by the space of two weekes thereon;" and ten pence were also paid for a lock to the same machine.

At the close of the fifteenth century, many of the principal cities of Europe were without public clocks, which could be procured only at great expense. Of this we have an instance in the city of Auxerre, the magistrates of which place, in the year 1483, ordered a clock to be made; but finding that it would cost a larger sum of money than that which they considered they had authority to dispose of, they applied to Charles VIII. to allow them to draw upon the public funds for the purpose.

In the annals of Dunstable Priory is this item:—"In 1483, made a clock over the pulpit." In early days an hour-glass was used as a time-measurer in churches, and occasionally the priest had a watch found him by his parish.

So early as 1484, Walther, and after him the Landgrave of Hesse, made use of a balance-clock for astronomical purposes.

In the churchwardens' accounts for Wigtoft, near Boston, Lincolnshire, under date 1484, we find an "Item, paide to Ric. Anngell for kepyng of (that is, looking after or managing) the clok, 3*s.* 4*d.*;" "Item, paide for dressyng of the clok, 10*d.*;" "Item, paid to Rob't Panlyn for di stone femble (femble or fimble, a kind of fine or female hemp) for lynes to clock plumes (plumbs or lead weights), and for makyng of the same femble, 5*d.*;" and "Item, paide for nailes to the said clok, 1*d.*" In the same accounts for 1511 is an "Itm, paid for i lyne for ye clocke, 3*d.*;" and a similar item occurs in 1519. In 1523, "Itm, payd to the cloke maker, 1*s.*" In 1525, "Itm, payd to the cloke maker, 5*s.*," and "Itm, for clok meynddyng, 4*s.*"

And in 1531, "Itm, for makyn of yt and for clot lens (clock lines) makyn, 6*d.*"

Venice had a clock in 1497. It appears from a letter written by Ambrosius Camaldulensis to Nicolaus of Florence, that clocks were not uncommon in private families on the Continent at the end of the fifteenth century. About this time the town-hall clock in the city of Prague was made by the celebrated astronomer, Hanusch, professor of mathematics in the university there. It exhibited the revolutions of the sun and moon, the day of the month, the length of the days and nights, and other things. A great portion of the movement was out of order about 1730.

From the frequency with which the word clock occurs in the Earl of Northumberland's 'Household Book,' from 1512 to 1525, it is evident that that mechanism was common in the period to which the volume refers.

In the Calendar of State Papers, *temp.* Henry VIII., we find a letter dated August 13th, 1516, from Tunstal to Cardinal Wolsey, in which the writer says that he had prepared for the prelate "a clock such as Richmond (described to) your grace. It is all ready, save the case, and that it (may stay) a season by the maker to see as it goeth, that if any (lack) be it may be amended. As soon as it is trimmed I shall have it conveyed to your grace." On September 1st following Tunstal, dating from Brussels, again wrote to Wolsey, stating that he sent by Richmond a clock as a present, which Richmond would inform him how to set, and he enclosed "the key of the case and the vice," whatever that may have been. Wolsey died as a clock struck eight, on November 28th, 1530, he having during his preceding illness predicted that he should die at that hour.

In an account of the receipts and disbursements of

the canons of the Priory of St. Mary, Huntingdon, for the years 1517 and 1518, is the following: "Item, six bells of a tune, and a clock bell, whereof the deepness and bredth appeareth by the inventory."

Nuremberg has from the earliest times been famous for its manufacture of horological instruments, as we shall have occasion to show during the progress of our history. In the treasury at Vienna are many curious clocks and watches of early Nuremberg make. At a meeting of the Archæological Institute, held on December 3rd, 1852, Mr. Octavius Morgan, whose collection of time-keeping machines is very choice and extensive, exhibited a table-clock which was fabricated at that city about 1525-50. At a meeting of this institute held at Gloucester in July, 1860, he displayed a clock or orrery constructed on the Ptolemaic system, the date of it being about 1540. At a meeting of the same institute, held on December 7th, 1855, the same gentleman exhibited a clock in the form of an hexagonal temple, and bearing the date 1545. At a meeting of the Society of Antiquaries, held on March 1st, 1855, Mr. Morgan exhibited a cylindrical or drum-shaped table-clock of silver gilt, resembling the Bohemian clock in the Society's collection, to which we have before referred, in form and construction, and probably of the same date. The movement was entirely of steel, quite original, and in perfect condition. The hand revolved once in twenty-four hours, and the hours were numbered from one to twenty-four. There were also on the face revolving discs and indices, showing the course of the sun and moon through the zodiac, and the age and phases of the moon. A mark at the bottom showed it to have been made at Nuremberg.

Numerous entries relating to clocks and watches,

which latter are called clocks, occur in the accounts of the 'Privy Purse Expenses of Henry VIII., from 1529 to 1532,' edited by Sir Harris Nicolas. The king appears to have patronized foreign artisans only. We find cited payments to Nicholas, the astronomer, for mending a clock. This was doubtless Nicholas Cratzer, a Bavarian, "deviser of king's horologies," of whom notices will be seen in the third series of 'Original Letters,' edited by Sir H. Ellis, and a detailed account by Admiral Smyth in the 'Archæologia,' vol. xxxiii., p. 14. Money was also paid to Anthony for a clock in a case of gold. In July, 1530, 15*l.* were "paid to the Frenchman who sold the king ij clocks at Oking." In the following month was "paid to a Frenchman called Drulardy for iij dyalls and a clokk for the king's grace," another sum of 15*l.* In December of the same year more clocks were supplied to the king; 19*l.* 16*s.* 8*d.* being "paid to Vincent Keney, clok maker, for xj clokks and dialls." From the fact that the king ordered and paid for so many clocks and watches in the space of only a few months, we may assume that some of them were intended as presents to be given by him. About a year later, namely, in January, 1532, were paid out of the king's private purse "to the French clokmaker for ij clokks xxx corons (crowns), and a rewarde of xx corons, in all lv corons." On March 15th in the same year were "paid to one Lycile, a widowe, for vij cloke cases, xxv.*s.* a pece." Another clock, "of iron with sondry dores of copper graven showing howe the see dothe ebbe and flowe," claims notice, as it may have been the astronomical clock constructed and presented to Henry by John Poynet, Bishop of Winchester, of whom Godwin relates as follows:—

"Mathematicarum porro scientiarum ad miraculum usque peritus, Henrico octavo dicitur horologium fabricasse, quod non solum horas vulgares ostenderet, sed diem etiam mensis, mutationes lunares, et fluxus atque refluxus maris tempora."

Among the many interesting objects of antiquity which were collected by Horace Walpole, and lodged in his sham castle at Strawberry Hill, was a handsome little clock of brass (by mistake sometimes said to have been silver gilt), which had been presented by Henry VIII. to Anne Boleyn upon their marriage in 1532. It was given to Walpole by Lady Elizabeth Germaine. At the Strawberry Hill sale this famous clock was purchased by Queen Victoria for 110*l.* 5*s.*, and it is now at Windsor Castle, and in going order. It is richly chased and engraved, and ornamented with fleurs-de-lis and other things. On the top is placed a lion bearing the arms of England. The weights are chased with the initials of Henry and Anne within true lovers' knots. One bears the inscription, "The most happye," the other, the royal motto. The clock has been repaired; the interior wheels are now all of brass, and the whole train is of comparatively recent date; while from the style of the mechanism and the adaption for a pendulum an inference may be drawn that the repair took place about the year 1680. This clock will be found figured in the 'Archæologia,' vol. xxxiv.; in Shaw's 'Dresses and Decorations;' and in Knight's 'London,' vol. iii., p. 160.

In a Royal Household Book, *temp.* Henry VIII. and Edward VI., preserved among the Records of the Court of Augmentations, now deposited at the Rolls, are inventories of certain valuable effects belonging to Henry

VIII. in the palace at Westminster in 1542. Among the effects were the following clocks:—

"Item, oone Clocke of iron with a case of glasse, the frame of the same case being iron gilt with iij plumettes of led and two belles whiche stryketh the quarter and half of an hower.

"Item, oone Larum or Watch of iron, the case being likewise iron gilt, with two plumettes of led.

"Item, oone Clocke of copper and gilt, with a man in the toppe of the same of like copper, holding the King his armes sett in silver and gilt, standing upon a fote of walnuttre garnishid with xij pillours of like wodde.

"Item, oone Clocke of iron with a Larum to the same, with the Kinges armes crownyd upon the same, with iij counterpoyses of copper, two of them wrythen and gilt, and the iij. de playne and nott gilt, with iij. smaller counterpoyses of like copper and gilt.

"Item, oone Clocke of iron having dores of copper and not gilt, with iij. belles and two men that stryketh the hower, and upon the top of the bell an egle gilt sett upon a case of iron colourid red, with iij. great plomettes of copper and iij. smale plumettes to the same, and the same clock having the chainge of the moone upon it.

"Item, oone Clocke of copper and gilt, with a chyme to the same, showing all the daies of the yere and the planettes, with iij. moving dialles to the same, oone of them beyng silver ennamuled blewe and the xij. signes gilt, with thre great counterpoyses of copper gilt, and iij. very smale counterpoyses of like copper gilt.

"Item, oone Clocke of copper and gilt, with a chyme to the same at the half hower, having the chainge of the moone, the Kinges armes graven upon the ij. dores,

with iij great plumettes of copper gilt, engraven with the Kinges and Quene Annes letters, and two smale plumettes like acorns gilt, and the iij. de wrethen all gilt.

"Item, oone rounde Clocke of iron, with sondry dores of copper graven, showing howe the see dothe ebbe and flowe, with a case of glasse sett in iron gilt, standing upon a foote or case of wodde, with iij. great counterpoyses and two smale of copper, and the iij. de smale oone being of led.

"Item, oone Clocke of iron, with a larum to the same, stryking butt oone stroke at the half hower, with a case of glasse sett in iron gilte and payntid, with iij great and iij smale plomettes of led.

"Item, oone Clocke of iron garnisshid with copper and gilt, with a George upon the top of the same, which Clocke goyth withowte any counterpoyse."

Sir Anthony Denny, to whose charge the effects enumerated above were entrusted, as keeper of the palace at Westminster in 1542, appears to have presented to Henry VIII. a very singular clock as a new year's gift. It was designed by Holbein, whose drawing, purchased by Horace Walpole at the sale of Mariette's collection, was exhibited to the Society of Antiquaries by Mr. Graves in 1848. It had on its summit a clock driven by wheelwork, below which were before and after noon dials, showing time by shadows; and beneath them was a clepsydra, indicating the quarters of an hour by means of a fluid.

Gemma Frisius proposed the use of a portable clock for ascertaining the longitude at sea about the year 1530.

At Waterton Hall is the clock which Sir Thomas More, who was beheaded in 1535, used in his study.

A deeply interesting picture from Holbein's design, although not from his hand, and now belonging to Mr. Charles Winn, of Yorkshire, represents the family of Sir Thomas in his house at Chelsea, of which Erasmus has left us such a charming description. Members of his family are grouped upon the rushes in the pleasant gallery, with its traverse or cross room, and over the chancellor's head hangs his famous clock, which still keeps time.

Pilkington, in his 'History of Dale Abbey,' Derbyshire, says, that "when John Staunton and the other monks surrendered the abbey in 1539, the abbey clock sold for six shillings."

At Hampton Court Palace, over the gateway in the second quadrangle of that portion of the building which was erected by Cardinal Wolsey, facing the east, were the dial and works of an old astronomical clock, which had engraven on it the initials of the maker, N. O., and the date of its construction, 1540. This clock when entire showed the twelve signs of the zodiac, with the rising and setting of the sun, the revolutions of the planets, the various phases of the moon, and other things. It is said to have been one of the first of this kind fabricated in England, and the oldest untouched clock in this country that went tolerably well. It appears that in 1575 a payment was made "To George Gaver, serjeante painter, for painting the great dial at Hampton Court, containing the howres of the day and night, the course of the sonne and mone, the xij signes with the characters of vij planetes, environed into a circle, the sea, shippes, and territories; and on the other side certian badges of the croune, all wrought in oil colours, as vermilion, &c., and guilded with fine goulde; for clensinge the sconde diall contg.

the howers of the daie, half-howers and quarters, and in divers places her matie trio of name, and sondrie her matie badges, wrought likewise in oyle colours and guilded with fine goulde."

A description of Hampton Court in 1649 tells us, that in the "clock-case, upon the Great Hall, there is one large bell, and a clock under it, very useful for the whole house, having a fair dial or finger upon the end of the said Great Hall, facing into the Great Court."

This clock was repaired by Lang Bradley, of Fenchurch Street, in 1711. Under the date 1742 we read in reference to Hampton Court that, "Over the portal of the second quadrangle is a beautiful astronomical clock, the workmanship and contrivance of the late celebrated Tompion, on which are curiously represented the rising and setting of the sun, his gradual progression through the twelve signs of the zodiac, the various phases of the moon, and other such emblamatical amusements as justly make it the object of universal admiration." This statement is assumed to be incorrect so far as it relates to Tompion; although Grose, in his 'Antiquities,' vol. iii., p. 145, makes the same statement as to the constructor. It seems that the clock was again repaired and altered between the years 1760 and 1800. Further particulars relating to it will be found in the 'Mirror,' vol. xxvii., p. 302. The present clock was made by Vulliamy, and was brought from the late Buckingham Palace, and put up here in 1835. G. P. R. James, the novelist, wrote the following lines on the old clock without hands at Hampton Court:—

Memento of the gone-by hours,
  Dost thou recall alone the past?
Why stand'st thou silent 'midst these towers,
  When time still flies so fast?

Where are the hands in moments fled,
That marked those moments as they flew,
To generations of the dead,
Who turned on thee their view,

To watch and greet the appointed time
Of every empty dream of joy,
Or wait in agony the chime
Which might such dreams destroy?

To thee the eager eye was turned,
Of pride, of policy, and power,
And love's own longing heart has burned
To hear thee mark his hour.

Pleasure and pastime, grief and care,
Have heard thee chime some change of lot;
While the dull ear of cold despair
Has heard, but marked thee not.

And thou art silent now, and still,
While round thy mystic dial runs
The legend of man's hours—though ill
As thou, he marks the suns—

Those rolling suns—those rolling suns
Unchronicled by both go on;
Though still each comments as it runs,
Till man's brief day be done.

Man's heart's too like thy face! on it
Records of passing hours may stand,
But stand unmarked by movement fit,
By chimes or pointing hand.

O dial! art thou raised on high
To speak reproach for life's abuse?
Or give to eager hope the lie?
Or tell time's future use?

The future! Thou hast nought to do
With it! The solemn past alone
Is that whereon thy comments go,
Fit gravestone of hours gone!

The future! Yes! at least to me
Thus plainly, thus, thy moral stands—
"Good deeds mark hours! Let not life be
A dial without hands."

In the bedroom of William III. at Hampton Court Palace is a clock which stands at the head of the bed, and was made by Daniel Quare. It is in shape like the old tall eight-day clocks, and is decorated at the top with gilt figures. It goes twelve months without requiring winding up.

In 'The Times' newspaper, February, 1827, an advertisement appeared for the "sale of a valuable and curious clock for 20*l.*, to go for twelve months." It stated that only three of these rare clocks were ever made, namely, one at Hampton Court, one in a nobleman's family, and the other at the advertiser's.

Babbage, in his 'Economy of Manufactures,' 1835, tells us that the extending the time of the action of forces "is one of the most common and most useful of the employments of machinery. The half-minute which we daily devote to the winding up of our watches is an exertion of labour almost insensible; yet, by the aid of a few wheels, its effect is spread over the whole twenty-four hours. In our clocks, this extension of the time of action of the original force impressed is carried still further; the better kind usually require winding-up once in eight days, and some are occasionally made to continue in action during a month, and even a year." Early in the last century at the Palazzo di Colonna at Rome was a portable clock, which was wound up only once a year, and showed the hour of the day, the month, the year, and other things. The Marquis of Bute had at Luton Park, Bedford, a clock which was contrived to go for one hundred years. In Sir John Moore's account of his "large sphere-going clockwork" ('Math. Compend.'), we read that it made a revolution of once in seventeen thousand one hundred years, by means of six wheels and five pinions, for the sun's apogeum.

At a meeting of the Cambridge Antiquarian Society, held on November 29th, 1847, Professor Willis made some remarks on a clock which had been found in an old house near Royston; but which was then in the museum of the society, for which it had been purchased by the private subscription of a few of the members. He considered it to have been made in the time of Henry VIII., but not in England. The works, having an escapement and pendulum, could not have been of that date, since a pendulum was first applied to clocks in the latter half of the seventeenth century. The case was in the form of a tower with corner pinnacles. The parapet of the sides was ornamented with what is termed flamboyant tracery formed of pierced work. On each side of the face was a pile of buttresses supporting an ogee arch enclosing the clock-face, the space between which and the arch was filled up by a mass of most beautiful stumped tracery. As stumped tracery was not used in England or France, the Professor supposed the clock was made in Germany, probably at Nuremberg.

In the year 1544 the Corporation of Master Clock-makers of Paris obtained from Francis I. a statute in their favour, forbidding any one who was not an admitted master to make clocks, watches, or alarums, large or small.

In the accounts of the Chamberlain of Norwich, among charges for the celebration of the exequies of Henry VIII. in 1547, a payment appears "to the Clarks of Cryste church, for ryngyng the clocher bells." The belfry or bell-house was sometimes called the clochier and the clokerre.

In the churchwardens' accounts of St. Margaret's, Westminster, under date 1548, is the following item:— "Also paid to the said John Ivery for the keeping of the v a clock and viii a clock, for half a yere and half a quarter ended at the same feast, 16*s.* 8*d.*"

We find in an account of the "Ordenarye Paymentes in Sept. 3 Edw. VI.," 1550, made on behalf of the king, the following "Item to Allaine Bawdyson, clocke-maker, by vertue of the Ks. warrant under his prevye signet dated at the palaice of Westm^r. the thurde daye of Aprill A^o. Regis Edwardi sexti iij^cio the wages or fee of viij by daye which Sebastian Lysney, clocke-maker, late enjoyed &c. xij^li iiij^s."

In the 'Calendar of State Papers,' *temp.* Edward VI., we find, under date December 25th, 1551, a letter written at Paris by Sir William Pickering to Sir William Cecil, in which the writer refers to a book entitled 'L'Horloge de Princes.'

Strype, in his 'Life of Sir John Cheke,' Secretary of State in the time of Edward VI., and who died in 1557, mentions that among other presents bestowed on him by the king was his own clock, which after his death came into the possession of Dr. Edwin Sandys, Bishop of Worcester (afterwards Archbishop of York, and father of George Sandys, the poet), who in 1563 gave it as a new-year's gift to Sir William Cecil, the Secretary, afterwards Lord Burghley. Strype, writing in 1705, says: "And among the rest of these greater Gifts of the King, I must not forget the mention of one smaller, a token yet of the Love he had for him; and that was of his own Clock, by which 'tis probable his Majesty with his schoolmaster had studied many an Hour. This Clock which he gave him, I can trace for two or three removes. From Cheke it came, whether by Gift or otherwise, into the hands of Dr. Edwin Sandys, who, being Bishop of Worcester in the beginning of Q. Elizabeth, about the year 1563, made a New Year's Gift of this old Clock to Cecyl the Secretary, which he said he was sure he would the rather accept, because it

was his old Master's of happy Memory, King Edward, and after, his loving and kind brother's."

Ellis, in his 'Original Letters,' gives us a copy of the epistle which Sandys wrote to Cecil with the clock, on December 28th, 1563. The following extract will show with what grace the Bishop made his gift:—"Suche ys the barreness of this Countrie that yt bringith nothing forth fitt to remember youe withall, and therfor I am bold to present youe with an olde Clock, in the stead of a Newyears gift, which I trust ye will the rather accept because yt was your olde masters of happy memorie King Edward's, and afterwards your lovinge and learned brother's Mr. Cheekes; and synce, hys who thinkith himself in many respectes most bounden unto youe."

In 'A Booke of Fees and Offices, primo die Augusti anno primo Regine Marie,' 1553, preserved in the library of Dulwich College, is an enumeration of artificers of various kinds, and among them we find a "Clocke keper, John de Moylym," and a "clockemaker, Nicholas Ursewe."

In an account of new-year's gifts presented to Queen Mary on January 1st, in the third and fourth years of her reign, 1556, we find the following: "By Nicholas Vrsin, a faire cloke, in a case, couer with blake vellat;" and "By John Demolyn, a cloke with a lambe on it of copper, guilt." Allowing for the caprices of ancient orthography, we conclude that these two donors were the same identical persons as those mentioned in the last paragraph, and were also skilled horologists settled in England. Nicholas Urseau is named in certain state papers, under dates 1572 and 1590, as Queen Elizabeth's clockmaker.*

In 1560 Tycho Brahe possessed four clocks, which

* *Vide* page 74.

indicated hours, minutes, and seconds; the largest had but three wheels, the diameter of one of them being three feet, and containing twelve hundred teeth, a proof of the imperfect state of clockwork at that period. Brahe also observed irregularities in his clocks dependent upon changes in the atmosphere.

At a meeting of the Archæological Institute held on June 3rd, 1853, Mr. O. Morgan exhibited a table-clock of about 1560–80; and at a meeting of the same Institute, held on January 3rd, 1851, Mr. N. T. Wetherell exhibited a hexagonal table-clock of the latter part of the reign of Elizabeth, the works of which were formed of brass.

In the South Kensington Museum is a clock in gilt bronze, with a perforated case, supported on a baluster-shaped stem with chiselled cartouche ornaments. The summit is surmounted by a palm-tree in gilt bronze. It is of Italian work, about 1570. The entire height is seven inches. It was purchased for 10*l.*

In a brief of the goods bequeathed by Archbishop Parker by his will, dated April 5th, 1575, we find a clock or watch, valued at 54*l.* 4*s.*, given to the Bishop of Ely, "baculum meum de cannâ Indicâ, qui horologium habet in summitate."

Queen Elizabeth's favourite, the Earl of Leicester, who spared no expense in the adornment and improvement of his princely seat of Kenilworth, caused a striking clock to be placed in the Cæsar tower, the oldest portion of that castle. This clock, as we gather from a contemporary description of it, had two dials, one facing south, and the other east; they were of large size, and coated with a light-blue colour, having the figures gilt. The clock-bell was good and shrill; but we are told that it "sang not a note" all the time that

Queen Elizabeth was a guest of the Earl, in the summer of 1575. The instrument was stopped, and the hands of both dials remained pointing at two o'clock. Laneham, writing at the time, gives the following account of the event: "Too dyalz ny unto the battilments ar set aloft upon too of the sidez of Caezar's Tour; one east, thoother soouth; for so stond they best, to sheaw the hoourz to the tooun and cuntree: both fayre, large, and rich, by byse for ground, and goold for letterz, whearby they glitter conspicuous a great wey of. The clok-bell, that iz good and shrill, waz commaunded to silens at first, and indeede sang not a note all the while her Highnes waz thear; the clok stood allso still withall. But mark now, whither wear it by chauns, by constellation of starz, or by fatel appoyntment (if fatez and starz do deal with dialz), thus waz it indeede. The handz of both the tablz stood firm and fast, allweyz pointing too just too a clok, still at too a clok."

In 1577, Moestlin had a clock which made two thousand five hundred and twenty-eight beats in an hour; and by counting the number of beats made during the time of the sun's passage over a meridian, the sun's diameter was determined to be 34′ 13″.

Mongez, in his 'Histoire de la Reine Marguerite de Valois,' tells us that in 1577 the town of Valenciennes was "ornée d'édifices somptueux, de fontaines agréables et d'horloges avec des carillons, qui avec une industrie propre aux Allemands, ne donnoient pas peu de merveilles à nos François, ne leur estant commun de voir des horloges représenter une agréable musique de voix avec autant de fortes de personnes que le petit chasteau qu'on alloit voir au fauxbourg Saint-Germain."

In the 'Calendar of State Papers,' *temp.* Elizabeth, under date April, 1582, we find a note of things con-

sidered of by Thomas Bedwell, among which was an idea to make a clock to go by water continually without setting. This, no doubt, was some inventor's crochet in the air about a perpetual clepsydra; but it does not appear that the authorities fostered it.

One of the most important discoveries in relation to the history of clocks, because upon it their accuracy mainly depends, was that of the isochronism of the pendulum, which Galileo, the famous astronomer, in 1582, when a student of medicine at the University of Pisa, happened to make while engaged in the Cathedral of that city in the contemplation of the lamps which swung by chains from the roof. He observed that their oscillations, whether great or small, were performed in equal times; the truth of which important fact he tested by the beats of his own pulse. He afterwards discovered that the shorter the pendulum the less was the time of its vibration—a fact which was ultimately demonstrated by Sir Isaac Newton. A pendulum of thirty-nine inches and two-tenths will oscillate once in a second precisely in the latitude of London; but the pendulum of a clock adjusted to time in that place requires to be lengthened if taken nearer either of the poles, or shortened if taken towards the equator. The first use that the young philosopher Galileo made of his discovery was to ascertain the rate and variations of the human pulse. Its application to clockwork was an after-thought, for which he has not the credit; the merit of the invention of pendulum-clocks being commonly attributed to Christian Huygens, a clever Dutchman, about 1657. A pendulum-clock was, however, made by Richard Harris, a London artist, for St. Paul's church, Covent Garden, in 1641 or 1642; Inigo Jones, the architect of this church, having been in Italy

while Galileo was living, possibly communicated to Harris what he had heard there of the pendulum. It is, moreover, said that the first pendulum-clocks made in England were constructed in the year 1622, by John Fromentel (or, as variously spelt, Fromantil, Fromanteel, and Formantil), a Dutchman. No doubt the date given is incorrect, and some authors fix it as 1656, and others as 1662. Evelyn, in his 'Diary,' under date May 3rd,1661, records that he "return'd by Fromantil's, ye famous clockmaker, to see some pendules." The 'Commonwealth Mercury,' of Thursday, November 25th, 1668, contains the following advertisement on this subject, by which it would appear that the mechanician's first name was not John, and that all the dates above enumerated are incorrect:—

"There is lately a way found out for making clocks that go exact and keep equaller time than any now made without this regulater (examined and proved before his Highness the Lord Protector by such doctors whose knowledge and learning is without exception), and are not subject to alter by change of weather, as others are, and may be made to go a week, or a month, or a year, with once winding up, as well as those that are wound up every day, and keep time as well; and is very excellent for all house clocks that go either with springs or weights; and also steeple-clocks, that are most subject to differ by change of weather. Made by Ahasuerus Eromanteel, who made the first that were in England. You may have them at his house, on the Bankside, in Mopes Alley, Southwark, and at the sign of the 'Maremaid,' in Lothbury, near Bartholomew Lane end, London."

Whoever invented or applied the pendulum, it seems that so early as the year 1000 of the Christian era the

Arabs were acquainted with the fact that a pendulous body, when set in motion, made two hundred oscillations in a given time, and that the time was exactly doubled when it had made four hundred.

Soon after the application of the pendulum to clocks, the idea of Gemma Frisius, to which we have referred at page 60, was attempted to be realized by Huygens in the construction of a marine clock, to ascertain the longitude. He also discovered that its pendulum vibrated slower as it approached the equator, which fact led the way to the subsequent discovery, that the earth is not a globe, but an oblate spheroid. The 'New York Independent' for December 15th, 1859, makes the following statement relative to a clock with a pendulum made by Huygens:—"The 'Hartford Times' says that a watchmaker in that city has repaired and set in running order a German clock more than two centuries old. It was built by Huyghens, somewhere about the year 1640 (?), and though it has not run for more than half-a-century, is now keeping good time, and may last another two centuries. It was found by the artist, Church, in the possession of a Dutch family in Nova Scotia, while he was off on his iceberg sketching expedition. In that family it had been handed down from father to son for generations. This is one of the very first clocks ever made with a pendulum. The action of the pendulum on the wheel is not direct by means of a pallet, as in the modern clocks, but operates by a vertical bar with 'snugs' on it, catching into the teeth at each oscillation of the pendulum. The clock strikes for the half-hour and hour, and is wound by means of an endless chain. It has an open frame of black, ancient oak, exposing the works, which are of brass and nicely finished."

In the South Kensington Museum is an astronomical clock, which was made by George Rollet and John Reinhold, of Augsburg, in 1584, and is said to have been constructed for the German Emperor Rudolph II. This instrument, which was presented to the Museum by Mr. R. Goff, consists of gilt metal in the form of a celestial globe, inscribed with the signs of the zodiac and other astronomical figures. On an orb below the globe is engraved the imperial two-headed eagle, crowned; and the globe itself bears in Latin the names of the makers, with the date. The whole is about sixteen inches in height, and the globe is seven inches and a half in diameter. This clock is engraved in the 'Illustrated London News' of April 7th, 1866, p. 336.

In Allen's 'History of Lambeth' we find the following as some of the principal items respecting the clock in the parish church of that place, occurring in the wardens' books:—

1585. Agreed that Holloway shall have iiiis. a yeare for oyle, for the clocke, and bells, and for candle to the clocke.

1599. Payd to Lewis Smalle, for keping the clocke, his wages, 12*s*.

1605. To Smalle, for keping the clocke, 16*s*.

1632. Payd for a new clock for the church, 5*l*.

The will of Bartholomew Newsam, of the Strand, clockmaker, dated in 1586, a copy whereof is given in the 'History of Clerkenwell,' by Pinks and Wood, contains some curious and interesting bequests of clocks and the tools for making them. The testator gave to his apprentice his "seconde clocke;" to a relative, his "best vice, save one a beckhorne to stand upon borde, a great fore hammer, and to (two) hand hammers, a grete longe beckhorne in my backe shoppe; and all the rest of my tooles I give unto Edward Newsom, my sonne,

with condicon that he become a clockmaker as I am, yf not I will the foresaid tooles to be sould by my executors." He gave to a friend "a sonne dyall of copper gylte;" to another, "one cristall jewell with a watche in it, garnished with goulde;" to another, "one watch gylte to shewe the hower;" to another, "a strickinge clocke in a silken purse, and a sonne dyall to stande uppon a post in his garden;" and to another, "a chamber clocke of fyve markes price." We find in the 'Calendar of State Papers' of the time of Queen Elizabeth, a grant in 1572 to B. N. (who no doubt was Bartholomew Newsam) of the office of clockmaker to the queen in reversion after the death or surrender of N. V. (probably Nicholas Urseau). In the same Calendar is a letter dated August 5th, 1583, from Bar*til*mew News*h*am to Sir Francis Walsyngham, desiring him to favour the writer's petition to her majesty for the augmenting a certain term of years wherein he had moved Sir Philip Sydney to speak to him. And under date 1590, we find a grant to Bartholomew Newsham of the office of clockmaker to the queen in place of Nicholas Urseau, deceased.* We learn from Queen Elizabeth's household accounts that she had in her service a clockmaker, who was receiving an annual fee of 18*l.*; and a clock-keeper, who was receiving 12*l.* 13*s.* 4*d.* per annum.

Hentzner, who wrote in the time of Elizabeth, tells us that that queen had in her palace at Whitehall, a piece of clockwork, consisting of "an Æthiop riding upon a rhinoceros, with four attendants, who all make their obeisance when it strikes the hour; these are all put into motion by winding up the machine."

We have another example of the testamentary gift of a clock in the will of Henry Stokes, of Turnmill Street,

* *Vide* page 67.

Clerkenwell, dated December 23rd, 1586, who thereby gave to Robert Stokes his "beste clocke."

In the churchwardens' accounts of the parish of St. John the Baptist, Glastonbury, according to Warner, in his 'History' of that city, and under date 1588, appear the following items:—"Also we receved of the old Wardings wch they collected towardes a clocke, xxs. We did collecte and geather towardes the clocke, xiiijs. jd."

On the horologe of the Earl of Essex and Ewe, now in existence, the name of the maker is thus engraved:—"James Kynvyn fecit. 1593."

At a meeting of the Royal Society held in March, 1848, a clock constructed by Isaac Habrecht in 1589 was exhibited. This ingenious piece of workmanship was for more than two centuries in the possession of the court of the Popes of Rome; and was subsequently the property of William I., King of the Netherlands, who authorized Odevaere, the antiquary, to investigate every thing concerning it, and to give a description of it, which he did in writing. It was exhibited in England in 1850, and afterwards came into the possession of Mr. O. Morgan.

The entire fabric bears decided proof of having been produced by manual labour, without any other assistance than the bench of the turner and the file. It had the ancient motive-power; the pendulum being a later invention, which has since been added to this clock. The design consists of a tower, divided into three stories, with doors of strongly gilt copper, tastefully chased and ornamented, and supported by twelve columns of the same metal. In front of the lower story, within a square chamber, is a large dial plate, which moves round its whole circuit only once a year; it shows also the date of the month, and all the Catholic feasts and holy days

throughout the year. In the centre is a small plate, very curiously chased, representing the twelve signs of the zodiac, with the sun and moon pursuing their course, so that at one glance can be ascertained in what sign of the zodiac they are at the time. Within this circle is a small globe, pointing out the proper phases and aspects of the moon; and within all this are the fixed stars setting, namely, the Serpent, Orion, the Great Bear, Casseiopeia, and others. The four corners of this chamber are emblematically engraved with the names of those nations who have conquered kingdoms at an early period.

In front of the second story are the minutes and minute-hand, and on each side are two silver figures, one hand of these figures pointing to the minutes, the other hand being set in motion by mechanism; during the striking of the clock, the one figure turns the hour-glass, as an emblem of time, and the other wields the sickle of death. Above each of the figures is a Latin verse: and in the middle of the plate is a simple yet correctly mathematical representation of how the globular form of the earth is perceptible to the eye. Above, the minute-hand describes a circuit of twenty-four hours, each half of the dial-plate containing twelve hours; the day hours being marked with the image of the sun, and the hours of the night with the image of the moon. On the four corners of the dial-plate are engraved the four seasons of the year.

The third story also consists of four divisions, which project in the manner of a balcony. Round the centre of the lower division move seven silver figures of heathen gods, in chariots, representing the seven days of the week; every deity makes its appearance once in seven days, exactly in front, where it remains for twenty-four hours, when it is relieved by the next. In the centre of

the second division is an image of the Virgin, holding her son Jesus in her arms; two angels are seen placing crowns and garlands on her head; and during the performance of the bells several angels appear making their obeisance before the image of Mary and the Saviour. Within the centre of the third division is a metal bell hanging on a gilt plate of copper, on which is represented the judgment day. Round this metal plate move four silver figures, set in motion by mechanism, representing the four states of social life. These images point out the quarters of the hour by striking the bell; the first quarter is represented by a youth, the second by a grave citizen, the third by a Roman soldier, and the fourth by a priest. In the fourth division is likewise a metal bell, on the sides of which are chambers; on the left side is the representation of Death, proclaiming the hours of day and night by striking the bell; above it is seen a Latin inscription, from Romans, chapter vii., verse 23rd. At the right side is the image of the Saviour, stepping forward, with the globe in his hand, and above it the cross. This figure proceeds, every two minutes, in a slow manner, and then, for a moment, hides itself from view; above it is a Latin verse from the prophet Hosea, chapter xiii. These two figures are of massive silver. Behind the bell is inscribed the name of the artist, and the date 1589.

The whole is covered with copper, beautifully worked in filagree; on the extreme top is stationed a silver cock, which at the close of the chiming of the bells spreads its wings, opens its beak, and crows; after which it resumes its former position. On the side doors are painted and gilt figures of the Virtues, with flowers, obelisks, and other ornaments; and within are figures of the Fates. These exquisite figures are stated to have been

engraved by the pupils of the maker. The clock stands about four feet high, independent of the pedestal. It is said to have been made by Habrecht for Pope Sixtus V.; and in many respects it resembles the famous Strasburg clock, of which it is evidently a model, since it performs all the feats of that clock.

The old church at Lubeck is considered to contain one of the most ingenious specimens of early clockwork that has been preserved. It represents the changes of the heavenly bodies until the year 1875; and when it strikes twelve a number of automaton figures are set in motion; the Electors of Germany enter from a small side-door, and perform the ceremony of inaugurating the Emperor, who is seated upon a throne in front. Another door is then opened, and Christ appears, when, after receiving his benediction, the whole cavalcade retires amidst a flourish of trumpets by a choir of angels. On each side are bas-reliefs illustrative of passages in the life of our Saviour. In that of the last supper a mouse is seen peeping from beneath the white table-cloth, and this animal represents the armorial bearings of the once puissant Lubeck.

The Germans, who were from the earliest times famous for their horological skill, were chiefly employed in the manufacture of clocks in England during the sixteenth century; but their work does not appear to have been of much account, or Shakespeare would not have made Biron say that a woman was

> . . . "like a German clock,
> Still a repairing, ever out of frame,
> And never going aright."

The English and the Augsburgers became famous for their clocks and watches, and made many of the

latter, and also table-clocks which showed the hours, the phases of the moon, and the days of the month. At Augsburg were also constructed most of the clocks and watches with moving figures, such as a Moor, a monkey blowing a trumpet, and similar toys moved by clockwork concealed within them. These toys were chiefly made and used for presents from the ambassadors of Christian countries to Oriental princes and barbarians. At Nuremberg is stated to have been made a miniature silver army of cavalry and infantry, which moved their limbs, went through their exercises, and fired by clockwork within them. In the cities of Augsburg, Nuremberg, and Ulm clock and watchmakers were obliged to observe certain ordinances; and also, as a proof of their skill and ability for a masterpiece, to make a horizontal, square, or hexagonal table-clock; masters' sons were free to choose which, and eight months' time was given them to complete the work. The artists of Augsburg and Nuremberg used to bring their clocks and watches in great numbers to Leipzig fair, and thus they were spread abroad over Europe. Nicholas Rugendas was a celebrated clockmaker of Augsburg in the sixteenth century.

In the South Kensington Museum is an Augsburg clock, in gilt bronze, with a dome-shaped cover, perforated and engraved with rich scroll-work. The sides are engraved with the story of the Good Samaritan. The height is five inches, the width five inches, and the diameter four inches and a quarter. It was purchased at the Bernal sale for 9*l.* 10*s.* Also a table-clock in a hexagonal gilt silver case, with cartouche ornaments and masks in silver. It is of Augsburg work. Its height is three inches and a quarter, and its diameter four inches. It was purchased at the Bernal sale for 11*l.*

Also an Augsburg clock in metal gilt, with a square pavilion-shaped case, domed top, and cover surmounted by a statuette of Hercules and the Lion. The case is richly chased and engraved with arabesque ornaments, fruits, and flowers. It has a dial on both sides. Its height is fourteen inches and a half, its width eight inches and a quarter, and its diameter seven inches and a half. It is of the sixteenth century; and was purchased at the Bernal sale for 19*l.* 10*s.* Also an Augsburg clock in metal gilt, in a pavilion-shaped case with two dials. At the summit is a female allegorical statuette standing on a globe. The angles of the case are decorated with sea-horses. This clock is of the sixteenth century. Its height is thirteen inches and a half, its width eight inches, and its diameter six inches. It was purchased at the Bernal sale for 90*l.* Also an Augsburg clock, upheld by a figure of Atlas on a richly engraved and perforated vase; the upper part surmounted by a smaller disc-shaped case and a small female statuette. The height is fifteen inches and a half, and the diameter of the large disc is six inches and one-eighth. It was purchased for 30*l.*

Viscount Hawarden has a cylindrical gilt timepiece, ornamented with arabesques, strapwork, and figures. It rests on three legs, composed of masks and goats' feet. It is of the sixteenth century, and Augsburg work. Mr. A. Barker possesses a gilt metal Augsburg clock of the same date, square in shape, with columns at the angles and a dome perforated top. Also a square, gilt Augsburg clock, with pilasters at the angles, cupola top, engraved with scrolls. And a square, gilt table-clock, resting on four knobs, of the seventeenth century.

At Goodrich Court is a curious table-clock of German

manufacture, the engravings of the costume on which show it to be of the time of Queen Elizabeth. It has two bells, one to strike the hours, and the other the quarters. Besides the larger front dial, it has two smaller ones, one with the twelve, and the other with the twenty-four hours; each having indices that move at the same time as the hands of the larger one. At the sides are dials to show how many times the greater bell has struck the hours, and what quarter the smaller one. At the back is an astrolabe surrounded by a circle of the twenty-four hours, and an index for astronomical purposes. The pendulum works outside. The whole is about fourteen inches in height, and is of metal partly gilt and partly silvered.

In the churchwardens' accounts for Great Wigston, Leicestershire, we find, under date 1593, an item as follows:—"Mr. Law's free gift to the new clock, 2*l.*"

In similar accounts for Great Marlow, Bucks, under date 1596, is an "Item, agred for the bells and sallett (salad) oyle for the clocke, 4*d.*"

In an aisle near the choir of the Cathedral of St. John, at Lyons, is a very curious clock, on the top of which stands a cock, that every three hours claps his wings and crows thrice. In a gallery underneath, a door opens on one side, and out comes the Virgin Mary; and from a door on the other side the angel Gabriel, who meets and salutes her. At the same time a door opens in the alcove part, out of which the form of a dove, representing the Holy Ghost, descends upon the Virgin's head. After this these figures retire, and from a door in the middle comes forth the figure of a reverend father, lifting up his hand and giving his benediction to the spectators. The days of the week are represented by seven figures, each of which takes its

place in a niche on the morning of the day that it represents, and continues there until midnight. The greatest curiosity is an oval plate marked with the minutes of an hour, which are exactly pointed out by a hand reaching the circumference, that insensibly dilates and contracts itself during the revolution. This curious machine, although not so perfect now in all its movements as when it was originally constructed, has suffered but little injury during a long course of years, owing to the care and skill of those who were appointed to look after it. It appears from an inscription on the clock itself that it was repaired and improved by one Morrison in 1661; but it was contrived long before that time by Nicholas Lipp, a native of Basle, who finished it in 1598, when he was about thirty years of age. The oval minute motion was invented M. Servier, and is of later date. There is a tradition that the ingenious artist, Lipp, had his eyes put out by order of the magistrates of Lyons, that he might not be able to make another clock like this; but so far from this being true, the justices of Lyons engaged him to take care of his own machine, at a handsome salary. Many ancient clocks exhibited processions of saints, who devoutly made obeisance to the Virgin and Child; and scarcely a town of any note upon the Continent was without some clockwork automata of strange conceits peculiar to itself. But the "serious vanity" of the mimicry was not calculated to produce any thrill of devotional awe, or the least impulse of veneration; it gratified only the sense of seeing.

Shakespeare frequently mentions clocks in his plays, showing that they were then common. The following are, perhaps, the most noticeable references made by him to them:—

"*Biron.* . . . . . .
What! I! I love! I sue! I seek a wife!
A woman, that is like a German clock,
Still a repairing, ever out of frame,
And never going aright."
Love's Labour's Lost, a. iii., s. 1.

"*Spring.* . . . . . .
When shepherds pipe on oaten straws,
And merry larks are ploughmen's clocks." *
Love's Labour's Lost, a. v., s. 2.

"*Rosalind.* I pray you, what is't o'clock?
Orlando. You should ask me, what time o' day;
There's no clock in the forest.
Rosalind. Then there is no true lover in the forest; else sighing every minute, and groaning every hour, would detect the lazy foot of time, as well as a clock."
As You Like It, a. iii., s. 2.

"*K. Rich.* . . . . . .
For now hath time made me his numb'ring clock;
My thoughts are minutes, and with sighs they jar
Their watches on to mine eyes, the outward watch,
Whereto my finger, like a dial's point,
Is pointing still, in cleansing them from tears.
Now, sir, the sound that tells what hour it is
Are clamorous groans, that strike upon my heart,
Which is the bell. So sighs, and tears, and groans,
Show minutes, times, and hours; but my time
Runs posting on in Bolingbroke's proud joy,
While I stand fooling here, his Jack o' the clock."
Richard II., a. v., s. 5.

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* Drayton, in his 'Moses,' speaks of—
"The cock, the country horologe, that rings
The cheerful warning to the sun's awake."
This passage seems to have furnished an idea to Cunningham, who in one of his 'Pastorals' says:
"In the barn the tenant cock,
Close to Partlet perch'd on high,
Briskly crows, (the shepherd's clock!)
Jocund that the morning's nigh."
Another non-mechanical horologe provided by nature is the downy head of the dandelion in seed, called "a clock," and by which in olden times children thought to count the hour by observing how many puffs it took to dissipate the seed.

The last line has reference to some automaton figure which struck the hour on a public clock's bell; for instance, one of St. Paul's Jacks, to which we have referred at page 20. Dials as well as clocks are named by Shakespeare in his plays; but the latter are more frequently mentioned.

"*Jaques.* . . . . . .
And then he drew a dial from his poke;
And, looking on it with lack-lustre eye,
Says, very wisely, 'It is ten o'clock.'
And I did laugh, sans intermission,
An hour by his dial."

As You Like It, a. iii., s. 7.

This was probably a pocket sundial, which was an article not uncommon at the time when the play was written.

"*Hotspur* . . . . . .
O! gentlemen, the time of life is short:
To spend that shortness basely were too long,
If life did ride upon a dial's point,
Still ending at the arrival of an hour."

Henry IV., a. v., s. 2.

"*Arch. of Cant.* . . . . . .
As many lines close in the dial's centre;
So many a thousand actions, once afoot,
End in one purpose."

Henry V., a. i., s. 2.

"*King Henry.* . . . . . .
O God! methinks it were a happy life
To be no better than a homely swain;
To sit upon a hill, as I do now,
To carve out dials quaintly, point by point,
Thereby to see the minutes how they run."

Henry VI. Part III., a. ii., s. 5.

CHAPTER III.

Curious Griffin Clock — Water-Clock — Frankfort Clock — James I.'s Clockmakers — Clock a Surname — Dutch Musical Clock — Foreign Clockmakers in London — Charles I. charters the Clockmakers' Company — Early History of the Company — Clock of St. Margaret's, Westminster — Clock at Augsburg — Clock in London Pageant — Clock in a Jesuits' College — Venice Clock — Streets named from Clocks — Clock which regulated the time of Charles I.'s Execution — Oldest Clock in America — Oliver Cromwell's Clock — Charles II.'s Gift of a Clock — Clock in Kendal Museum — Evelyn's Entries about Clocks — Ball or Bullet Clocks — Pepys sees curious Clocks — Elementary, or Earth, Air, Fire, and Water Clocks — Fulham Clock — Sir Edward Lake's Gift of a Clock — Alarum Clock mentioned in a State Paper — Pepys sees a curious Clockwork — Charles II.'s Clocks — Cosmo III.'s Record of a Clock — St. Dunstan's Clock — Its Mechanical Figures — Clock at Bristol — Bennett's Mechanical Clock Figures — Sir Matthew Hale's Clock — Milton's Lines for a Clock Case — Dryden's Reference to a Clock — Duchess of Gloucester's Striking Clock — Clock by Tompion — Clock at Windsor Castle — Clockmakers' Tokens — Grollier's Clocks — Inclined Plane Clocks — Clock mentioned in a Satirical Poem — Derham's 'Artificial Clockmaker' — Mechanical Clock made in compliment to Louis XIV. — Versailles Clock — Maria Antoinette's Clock — Clock of the King's Death — Clock at St. Cloud.

At a meeting of the Archæological Institute, held on March 1st, 1861, and also at a meeting of the Society of Antiquaries, held on June 20th in the same year, Mr. O. Morgan exhibited a miniature clock in the form of a square tower surmounted by a dome, on which stood the figure of a boy playing on a lute. The height of the clock without the dome was only one inch and three quarters. The case was of silver gilt, the works of steel. It went twelve hours, struck, and had an alarum. Mr. Morgan believed it to be of German work, and placed its date about the year 1600. It was

the smallest standing clock he had ever met with. And at a meeting of the same institute, held on December 7th, 1855, the same gentleman exhibited two clocks of novel design and construction. One was in the form of a griffin, bearing an escutcheon, on which was the dial. The animal constantly rolled its eyes whilst the mechanism was in movement, and it opened its mouth when the quarters struck, and flapped its wings at the striking of the hour. The other was in the form of a crucifix; the hours were shown on a globe which revolved on the top of the cross. The date of these strangely-shaped clocks was the early part of the seventeenth century. In the South Kensington Museum is another clock arranged as a crucifix. It is of ebony, silver, and gilt and enamelled bronze. It is of French or Flemish manufacture, of the seventeenth century. Its height is fourteen inches and a half. It was purchased for 6*l.*

The Hon. W. B. Warren Vernon has a clock of gilt metal in the form of a turret, with a pinnacle top, upon a stand of ebony. It has chased silver ornaments, and is of the seventeenth century, and of French manufacture. In the South Kensington Museum is a medallion clock, in a rock-crystal case, supported on a baluster-shaped crystal stem. It is dated 1609. Its height is seven inches and three quarters. It was purchased at the Bernal sale for 14*l.* Mr. A. J. B. Beresford Hope has a gilt metal clock with columns and pinnacles at the angles, engraved dial, and square *repoussé* stand. It was made at Strasburg in 1614. Also a gilt metal table-clock of hexagonal shape, with glass panels, resting on six terminal figures. It is of the seventeenth century.

In a manuscript of the beginning of the seventeenth century, preserved in the British Museum, and entitled

'A Catalogue of Natural and Artificial Curiosities within the County of Oxford,' mention is made of "a clock that goes by water at Hanwell."

In 1605 a clock was put up in the cathedral at Frankfort. It consisted of three parts or divisions; in the lowest, which looked like a calendar, were several circles, the first of which showed the days and months; the second, the golden number, with the age and change of the moon; and the third the dominical letter. The fourth and fifth circles represented the ancient Roman calendar. On the sixth were the names of the apostles and martyrs, the length of the days and nights, and the entrance of the sun into the twelve signs of the zodiac. The seventh and eighth circles exhibited the hours and minutes when the sun rose and set. In another circle the divisions of the twelve signs of the zodiac, the four seasons, and the twelve months were marked. A circle in the centre showed the movable feasts. The figures which struck the hours represented two smiths with hammers in their hands. This piece of mechanism was repaired for the first time in 1704.

In Devon's 'Issues of the Exchequer,' the Pell Records of the time of James I., we find the following entries:—1605, 10th of October. "By Order, the last of September, 1605. To Uldrich Henche, clockmaker, or to his assignee, the sum of 100*l.* for a clock, in manner of a branch, made by him, and set up in his Highness's chamber at Whitehall. By writ dated 23rd of July, 1605. 100*l.*"—1607, 5th of July. "To Humphrey Flood, goldsmith, or his assigns, the sum of 120*l.*, in full satisfaction and payment for a clock covered with gold and set with diamonds and rubies, and by him delivered to his Majesty's use, at the price of 220*l.*, whereof received 100*l.* By a Privy Seal dated the 5th

of July, 1607. 120*l.*"—1617, 1st of April. "By Order, dated 29th of March, 1617. To Ranulph Bull, keeper of his Majesty's great clock, in his Majesty's palace of Westminster, the sum of 56*l.* 13*s.* 4*d.*, in full satisfaction and discharge of and for divers sums by him disbursed for mending the said clock, in taking the same and other quarter clocks all in pieces, and repairing the same in the wheels, pulleys, hammers, weights, and in all other parts, and in new hanging, wiring, and cording of the same clock, and other necessary reparations thereunto belonging, the charge whereof, with his own workmanship and travail therein, doth amount to the sum aforesaid, appearing by a note of the particular demands, delivered upon his oath, taken before one of the Barons of his Majesty's Exchequer, without account or imprest to be made thereof. By writ, dated 27th of March, 1617. 56*l.* 13*s.* 4*d.*" It will be observed that the last payment was made to Ranulph Bull. We find in an account of the household expenses of Prince Henry, in 1610, Emanuel Bull, the "clocke-keeper," mentioned. Probably he was some relation of the clock-keeper of James I., if not the same identical person.

In the collection of State Papers of the year 1622, in the same king's reign, there is a warrant to pay 232*l.* 15*s.* to David Ramsey, the king's clockmaker, for repairing clocks at Theobalds, Oatlands, and Westminster, and for making a chime of bells adjoining to the clock at Theobalds. On the accession of Charles I., Ramsey was again appointed the king's clockmaker, and was also nominated the first Master of the Clockmakers' Company in the charter of incorporation in 1631.

Among the curiosities of horology is the fact that the word clock has become a surname. Thus, we find in

the 'Calendar of State Papers,' *temp.* James I., under date May 1st, 1609, a power-of-attorney from Sir Edward Musgrave, of Hayton, Cumberland, to John Clock, of Staple Inn, Middlesex, to receive on his behalf 20*l.*, lent by him to the king on privy seal, on July 31st, 1604. And in 1618 a man named Peter Clocke was living in St. Olave's, Southwark. He is thus entered in a return now in the State Paper Office:—"Petter Clocke; b. in Turnney; in England 4 yeres; and his wyfe, taffety wever; 2 children borne in Tornney." The 'Annual Register' for 1775, tells us of letters patent granted to William Clockworthy, for the sole use of a discovery of certain materials for the making of porcelain.

Among the State Papers of the time of James I. there is an original letter, dated August 4th, 1609, addressed by Sir Julius Cæsar to the clerks of the Signet, requesting them to prepare a warrant to pay 300*l.* to Hans Niloe, a Dutchman, for a clock with music and motions. And on the 17th of the same month Sir Julius wrote from the Strand to Salisbury, stating that he was pressed by Hans Niloe for the 300*l.* for his clock.

It would seem that foreign artizans were at this period extensively employed in clockmaking in England; and it appears from documents which are now in the State Paper Office, that early in the seventeenth century there were in London fifteen clockmakers and two watchmakers, all of whom were foreigners. By "A true Certificat of the Names of the Straungers residing and dwellinge within the City of London," &c., taken by direction of the Privy Council, by letters dated September 7th, 1618, we find that in the ward of Farringdon Within was then living "Barnaby Martinot, clock-

maker; b. in Paris; a Roman Catholicque." In Portsoken ward was living "John Goddard, clockmaker; lodger and servant with Isack Sunes in Houndsditch; b. at Paris, in Fraunce; heer 3 yeers; a papist; yet hee hath the oath of allegiance to the king's supremacy, and doth acknowledg the king for his soveraigne dureing his abode in England; and is of the Romish church."

In the year 1622, the clockmakers of London complained to James I. of the great number and deceitful tricks of foreigners practising their trade, and begging that they might not be permitted to work except under English masters, and that no foreign clocks might be imported. In 1631 the Clockmakers' Company of London was incorporated by a royal charter, dated August 22nd, in that year, from Charles I., as "The Master, Wardens, and Fellowship of the Art of Clockmakers of the City of London." The company had power by their charter to make by-laws for the government of all persons using the trade in London, or within ten miles thereof, and for the regulation of the manner in which the trade should be carried on throughout the realm. And in order to prevent the public from being injured by persons "making, buying, selling, transporting, and importing any bad, deceitful, or insufficient clocks, watches, larums, sundials, boxes, or cases for the said trade," powers were given to the company by the charter "to enter with a constable or other officer any ships, vessels, warehouses, shops, or other places where they shall suspect such bad and deceitful works to be made or kept, for the purpose of searching for them;" and if entrance should be denied they might effect it by force. This right of search was constantly exercised until the end of the century. The town was divided into districts, periodical searches were made,

and many instances are recorded of deceitful works being found and broken up.

By the charter of incorporation of the Clockmakers' Company, David Ramsey was elected the first Master, and Henry Archer, John Wellowe, and Sampson Shelton were the first wardens. The Company, from their establishment in 1631, having no hall, held their meetings at some tavern in the city. Their last meeting before the fire was held on August 20th, at the 'Castle' tavern, in Fleet Street; and the first meeting after, on October 8th, 1666, at the 'Crown' tavern, in Smithfield. After the fire the 'Castle' tavern was rebuilt; and in October, 1735, the obituary of that month records the death of Sir John Tash, Knight, Alderman of Walbrook ward, who formerly kept the same tavern, and was one of the most considerable wine-merchants of London. He was then in the sixty-first year of his age, and commonly reported to be worth 200,000*l*. The Company tried very hard for a livery for many years, and upon one occasion when they petitioned for it to the Court of Aldermen, there was a very long discussion thereon, and upon a division the twenty Aldermen present voted as follows: for, six; against, twelve; neuter, two, consequently the petition was again rejected. This was on July 11th, 1749; but a few years later the Company succeeded; and on Lord Mayor's Day, November 9th, 1767, at the inauguration of the Right Honourable Thomas Harley, brother to the Earl of Oxford, as Chief Magistrate, we are told in a newspaper of the following day, that "The Tin-plate Workers' Company and the Clockmakers' Company joined the Lord Mayor's procession yesterday for the first time since they were made Livery-Companies, and made a genteel appearance."

The Company is strictly a trade one, and is governed by a Master, three Wardens, and twenty-eight Assistants, chosen out of the fellowship. They have no hall, their meetings being held at the 'London Tavern,' where they have several paintings which were presented to them by old members.

The Company has a lending library, rich in English and foreign works on horology and the allied sciences, with a printed catalogue, published in 1830; and a cabinet of specimens of watches, containing many rarities; also of watch and clockwork, illustrative of the progress of horology from its commencement. The Company's motto appropriately runs "Tempus Rerum Imperator" (Time the Governor of all things).

In the year 1698 an Act was passed, 9 William III., c. 28, for protecting both the trade and the public against certain fraudulent impositions then practised by foreigners and others. The second clause of the statute recited that "great quantities of boxes, cases, and dial-plates for clocks and watches have been exported without their movements, and in foreign parts made up with bad movements, and thereon some London watchmakers' names engraven, and so are sold abroad for English work; and also there hath been the like ill practice in England by divers persons, as well as by some professing the art of clock and watchmaking, as others ignorant therein, in putting counterfeit names, as also the names of the best known London watchmakers on their bad clocks and watches, to the great prejudice of the buyers, and the disreputation of the said art at home and abroad." For the preventing of such ill practices it was ordained that no case or dial-plate should be in future exported without the movements, nor without the maker's name and place of abode

engraven on every such clock and watch, under a penalty of forfeiture and a fine of twenty pounds. In the 27th year of the reign of George II., c. 7, another clock and watchmakers' act was passed.

The journal of the Clockmakers' Company makes mention of a clock which cost 3*l.* in 1636.

In the churchwardens' accounts for St. Margaret's, Westminster, under date 1617, is an "Item, paid to Leonard Tenant, for a new clock and chimes and twoe dyals, and for a barrel, and pricking thereof, and for wyers to the chimes, and for all the iron-work, and workmanship in the setting up, and finishing of the same, according to an agreement made with him in that behalf, being for the use of this church and parish, 37*l.*" And under date 1658 is an "Item, to Mr. Farmer, for making of the new diall on the west-end of the church, as by his bill appeareth, 14*l.* 10*s.*;" and "Item, to Mr. Farmer, for a new dyall at the west end of the church on the churchyard side, 7*l.*"

In the 'Monasteriologia' of Stengelius, published in 1619, is an engraving of the monastery of Saints Ulric and Afra, at Augsburg, showing a clock, with a bell in a turret over it, in the upper part of a building adjoining the gateway entrance.

An account of the London Pageant given in honour of James I., in 1620, tells us that a part of the show "was a chariot painted full with houre-glasses and sundialls; the fore-wheeles were two globes, and the hinder wheeles were like two church-dialls. Within it aged Time was drawne, seated upon an houre-glasse."

In the State Paper Office is an inventory of goods which were found in a Jesuits' College in Clerkenwell, in 1627–8; and among the articles enumerated therein

are "one strikeinge clocke" and "one hanginge watch with an alarum."

In the South Kensington Museum is a table-clock in gilt bronze, the sides of which are decorated with allegorical figures in relief, representing impersonations of Arithmetic, Geometry, Music, and Astrology. It is of German work, about the year 1640. It was purchased for 6*l.*

So early as the seventeenth century there was in a tower in the Grand Piazza at Venice, an old clock, which not only pointed out the hours and their subdivisions, but also exhibited the signs of the zodiac, with the courses of the sun and moon. On certain festivals, and especially every hour while Ascension fair lasted, the statues of an angel and the three kings, or eastern magi, made their appearance at a door in this clock, and in passing made obeisance to the figures of the Virgin and Child placed in a niche, and then returned through another door on the opposite side. On the top of the tower were two brazen Moors, or, as Longfellow calls them, "bronze giants," who struck the hours with hammers on a large bell. This piece of clockwork resembled that at Macerata; but the images in the former were larger.

Evelyn, in his 'Memoirs,' under date 1645, records that while he was at Venice he went "thro' an arch into the famous Piazza of St. Marc. Over this porch stands that admirable clock, celebrated next to that of Strasburg for its many movements; amongst which, about 12 and 6, which are their houres of Ave Maria when all the towne are on their knees, come forth the 3 Kings led by a starr, and passing by ye image of Christ in his Mother's armes do their reverence, and enter into ye clock by another doore. At the top of

this turret another automaton strikes ye quarters. An honest merchant told me that one day walking in the Piazza, he saw the fellow who kept the clock struck with this hammer so forceably, as he was stooping his head neere the bell to mend something amisse at the instant of striking, that being stunn'd he reel'd over the battlements and broke his neck."

This clock was thus described early in the present century, when it was seen by the writer:—"The Horological Tower is in the splendid square of the Imperial Palace at Venice. It is also called the tower of the clock; it contains the city clock and a bell, with two large bronze human figures, who, with huge hammers, regularly strike the hours. Midway up the Horological Tower sits a noble bronze gilt figure of the Virgin and the infant Jesus, with an open gallery in front of her, facing the square. On each side is a door opening into the interior. At the striking of the clock, these doors fly open, and several persons move out in succession; the first is a trumpeter, who raises his trumpet to his mouth as he comes in front of the Virgin; then follow three others in succession, dressed like eastern sages, and one of them a person of colour. They all pass in front of the Virgin round to the other side, bowing as they pass; then halting a moment, they straighten up, and entering the other door disappear. This is called the Visit of the Magi."

White, in his 'Fragments of Italy and the Rhineland,' 1841, tells us that "At a certain period of every year, namely, on the Feast of the Ascension, and fourteen days afterwards, the great clock tower of St. Mark's, which by the way is an edifice boasting a barbaric confusion of ornament that rivals any of its fellows in that Noah's ark of architecture, exhibits a

curious piece of mechanism. On the summit of the Orologio is a great iron bell, forming a kind of cupola to the gateway, and heaving its black form against the bare sky. On each side stands a savage man of Ind, grasping an iron mace, with which he beats the hour upon the bell. On a platform midway in the building, and just over the huge gold and blue enamelled disk of the dial, is a balcony of gilt lattice, surrounding an image of the Blessed Virgin and Child, who is seated between two doors all overlaid with gold. Whenever the clock strikes, the door on her right hand opens, and an angel with a trumpet in his hand steps out, he acts as gentleman-usher to the Three Royal Magi, who pass before her, just as you might do before Queen Victoria at a levee, only that, instead of kissing hands, each raises his diadem or turban from his brow, makes a graceful obeisance, and in stately procession re-enters the turret by the other door. The figures are apparently as large as life, and gorgeously apparelled; and it really is a pretty pageant."

A street in Venice is named after this Orologio—a kind of nomenclature of which we have another example at Rouen, where the Rue de la Grosse Horloge, or the street of the great clock, is so called from a huge, clumsy, antiquated clock, that is attached to the upper part of an arch across the street.

At Vicenza, in the Piazza de' Signori, which is a minified copy of the Piazza San Marco at Venice, is a small Torre dell' Orologio, or clock-tower, somewhat after the style of the one at the latter city, above described.

The 'Gentleman's Magazine' for 1799 informs us of the death at Green Street, on March 24th, in that year, of Mrs. Forester, aged eighty-three, the widow of the

then late Rev. Dr. F. Moore, and the daughter of the Hon. and Rev. Dr. Moore. This lady possessed at Great Brickhill, Bucks, the identical clock which was at Whitehall at the time of the execution of Charles I., in the year 1649, and by which the fatal moment was regulated. The effects of Mrs. Forester were shortly after her death dispersed by public sale.

The Philadelphia Library claims possession of the oldest clock in America; it wants but a few years of being two centuries old. It was made in London, keeps good time, and is said to have been once owned by Oliver Cromwell.

Charles II., according to tradition, gave to Mrs. Jane Lane a clock in memory of her services after the battle of Worcester. On the clock was engraved the name of "Henricus Jones, Londini." In North's 'Life' it is stated that barometers were first made and sold by one Jones, a noted clockmaker, in the Inner Temple Gate, at the instance of the Lord Keeper Guildford. Probably Jones was the first Englishman who constructed a Torricellian tube, as the barometer was originally called after its inventor, Evangelista Torricelli, who between the years 1641 and 1647 discovered the means of ascertaining the weight of the atmosphere by a proportionate column of quicksilver.

In the Museum of Kendal is an interesting specimen of a clock, which is said to be one of the first ever made on the pendulum principle. It stands on a bracket; it has one weight suspended by a cord, and only one hand; it goes twelve hours; but by cutting away the floor beneath it, it could be made to go twenty-four. The bell forms a dome over the clock; it has an excellent sound, and strikes all the hours. On each side of the case is a brass door. The clock still keeps

correct time. On the dial is the following inscription: "J. C. George Pooll in S. Ans Lane Fecit. The Guift of James Cock, Maior of Kendall, 1654, to the Maior of the same sucksesiuely. Time runeth; your work is before you." Old Humphrey wrote one of his 'Pithy Papers' upon the subject of this clock and its motto, and has thereon hung a moral.

Evelyn in his 'Diary' has three curious entries respecting clocks. Under date February 24th, 1655, he says: "I was shew'd a table clock whose ballance was onely a chrystall ball sliding on parallel wyers without being at all fixed, but rolling from stage to stage till falling on a spring conceal'd from sight, it was throwne up to the upmost channel againe, made with an imperceptible declivity, in this continual vicissitude of motion prettily entertaining the eye every halfe minute, and the next halfe giving progress to the hand that shew'd the houre, and giving notice by a small bell, so as in 120 halfe minutes, or periods of the bullet's falling on the ejaculatorie spring, the clock part struck. This very extraordinary piece (richly adorn'd) had been presented by some German Prince to our late King, and was now in possession of the Usurper, valu'd at 200*l*." Under date November 1st, 1660, Evelyn says, "I went with some of my relations to Court, to shew them his Ma^{ties} cabinet and closset of rarities. . . . . Here I saw . . . . amongst the clocks, one that shew'd the rising and setting of the Sun in y^{e} Zodiaq, the Sunn represented by a face and raies of gold, upon an azure skie, observing y^{e} diurnal and annual motion, rising and setting behind a landscape of hills, the work of our famous Fromantel." On August 9th, 1661, Evelyn says, "I din'd at Mr. Palmer's in Gray's Inn, whose curiosity excell'd in clocks and pendules, especialy that

had innumerable motions, and plaied 9 or 10 tunes on the bells very finely, some of them set in parts, which was very harmonious. It was wound up once in a quarter."

Pepys in his 'Diary,' under date July 28th, 1660, records that he went "To Westminster, and there met Mr. Henson, who had formerly had the brave clock that went with bullets (which is now taken away from him by the King, it being his goods)." After the dates given by Evelyn and Pepys as above it was not uncommon for clocks to be made with a small ball or bullet on an inclined plane, which dropped every minute. Gainsborough, the painter, had a brother who was a dissenting minister at Henley-on-Thames, and who possessed a strong genius for mechanics. He invented a clock of very peculiar construction, which after his death was deposited in the British Museum. It told the hour by a little bell, and was kept in motion by a leaden bullet, which dropped from a spiral reservoir at the top of the clock into a little ivory bucket. This was contrived so as to discharge it at the bottom, and by means of a counter-weight it was carried up to the top of the clock, where it received another bullet, which in its turn was discharged like the former. This seems to have been one of the many attempts made at perpetual motion.

In 1663, Martinelli, of Spoleto, wrote a curious work, describing various methods of constructing what he calls elementary clocks, that is, clocks which were set going by earth, air, fire, and water; some of which could be made to show the time of day, the days of the week and month, the courses of the moon and planets, with the Epact. Time was measured in the water-clocks by suffering that element to pass successively through the compartments of a drum-shaped cylinder,

acting as a pulley to a cord with a counter-weight, the rapidity of the motion being determined by the quantity of the water, or the bore of the orifice through which it escaped. The motion of the earth, or sand clock, was regulated in a similar manner. In the air-clock time was measured by the pumping of a bellows, like those of an organ, the gradual escape of the air regulating the descent of a weight, which carried round the wheels, as in other time-keepers. In the fire-clock the motion was produced upon the principle of a modern smoke-jack, the wheels being moved by means of a lamp, which also gave light to the dial; and the clock could be made to announce the several hours by placing at each a corresponding number of crackers, which by certain contrivances were exploded at proper times. He tells us that these clocks offered considerable advantages to persons troubled with insomnia, or want of sleep, as they gave a soft light, and without noise marked the silent flight of time.

In Bagford's Collections in the British Museum, Harl. MSS. 5931, is the following advertisement of a clock which was moved merely by the exhalations of a lighted candle:—"The Turkish Seraglio, in Waxwork. The Story of Queen Voadicia, &c. The Temple of Ephesus, &c.; and of Apollo; the vision of Augustus; and the six Sibyls, &c., the fatal sisters, that spin, reel, and cut the thread of man's life, &c. Moving figures, &c. An old woman flying from Time, who shakes his head and hour glass with sorrow, at seeing age so unwilling to die. Nothing but life can exceed the motion of the heads, hands, eyes, &c., of these figures, &c. Other curious pieces of clockwork, and rarities, &c. A clock like the long pendulums now in use, but internally different, the motions of the two hands and striking regu-

lated without pendulum or balance or fly, by the exhalations of a lighted candle, not hid, but exposed, and of the same use as if placed in a candlestick, &c. Mrs. Salmon teaches the full art, sells all sorts of moulds and glass eyes, with other materials, and takes likenesses of gentlemen and ladies, in St. Martin's, near Aldersgate-street. Prices 6*d.*, 4*d.*, and 2*d.*" Mrs. Salmon removed soon after from St. Martin's-le-Grand to the Golden Salmon, at Temple Bar, which she says was a more convenient place for the coaches of the quality to stand unmolested. Her collection of waxwork figures was for half-a-century one of the most popular exhibitions in London, especially to country visitors.

We read in Faulkner's 'History of Fulham and Hammersmith,' that the clock in Fulham Church steeple was the gift of an individual in order to exonerate himself from serving any office during his residence in the parish, as appears by the following extract from the parish books, dated August 14th, 1664:—

"Ordered, that Richard Goslinge, of this parish, brickmaker, bee and is from this day forward, during his abode in this parish, quitted from bearing any office off and belonging to the parish of Fulham, upon condition if the said Richard Goslinge doe, at his own proper costs and charges, give an able and substantial clock, not under the value of 12*l.*, and y^{t} the old clock bee given unto the said Rich^{d}. Goslinge, which new clock is the voluntary gift of him the said Rich^{d}. Goslinge, in consideration of the privileges aforesaid."

Sir Edward Lake, by his will dated April 8th, 1665, gave as follows:—"To the church or chappell of Normanton, near Pontefract, in Yorkshire (if there be a church or chappell there, which I know not), where my paternall ancestors have lived for many years," a clock,

and a sum "for the maintaining and keeping of it for ever." In Normanton Church is this inscription referring to the gift:—

"Edwardus Lake de Norton Episcopo, in
Comitatu Lincolniensi Eques Auratus
LL.D. Diocesecos Lincolniensis Cancellarius
In majorum memoriam qui olim in hoc oppido
Normantoniæ habitaverunt, hoc Horologium
Dedit, ac etiam decem solidos ad reparationem
Ejusdem annuatio in perpetuam solvendos
Deo et Carolis Regibus dominis suis
Presertim, Carolo Martyri Pacis et Belli
Tempore fideliter nec non insigniter inserviit.
Et animam Deo pie reddidit 18 die Julii anno
Etatis suæ 77 annoq. Domini 1674.
Et Ecclesia Cathedrali Beatæ Mariæ Lincoln.
Sepultus jacet."

In the 'Calendar of State Papers,' *temp.* Charles II., under date May 10th, 1666, we find a letter in French from M. de Marainville to M. de la Fabvollière, requesting him either to return to M. De Samborne the alarum-clock which he, the writer, had lent him, or if it suited him, and he wished to keep it, to pay for it seven pieces, the price the clockmaker at Charing Cross offered for it.

On September 6th, 1667, the sight-loving Pepys went with his wife to Bartholomew Fair, and after witnessing a man whose legs were tied behind him dance upon his hands, next "went to see a piece of clockework made by an Englishman—indeed, very good—wherein all the several states of man's age, to 100 years old, is shewn very pretty and solemne."

In the Camden Society's 'Secret Services of Charles II. and James II.,' vol. lii., are various accounts of payments made on behalf of the King, some of which were for clocks supplied to him. Thus, in the account up to

April 3rd, 1668, is an item, paid "To Humfry Adamson, for a clock by him sold for the chappell at Whitehall, 19*l.* 7*s.*" In the account up to March 9th, 1682, is an item, paid "To W^m^ Chiffinch, for so much money he paid Sam^l^ Watson, for a clock he sold his late Ma'tie, w^ch^ showes the rising and setting of the sun and moon, and many other motions, 215*l.*" His late majesty must have been Charles I. In the account up to July 3rd, 1682, is an item, paid "To Mr. Knibb (no doubt the same person as the one to whom we have referred at page 112), by his said Ma'ties comand, upon a bill for clockwork, 141*l.*" In the account up to December 9th, 1682, is a debit, "To Rob^t^ Seignior, for a clock bought of him, and sett up in the Trea'ry Chambers, for the use of the Commissioners of his said Mat^s^ Trea'ry, 20*l.*" All these payments were made in the reign of Charles II.

In 1669, Cosmo III., Grand Duke of Tuscany, relates in his travels that he saw at the Royal Society of London, a clock, the movements of which were derived from the vicinity of a loadstone; and it was so adjusted as to discover the distance of countries at sea by the longitude. This clock, says Mr. Weld, in his 'History of the Royal Society,' together with Hooke's magnetic watches, were on the occasion of the visit of illustrious strangers, always exhibited as great curiosities.

The mechanism of Venice clock, which we have before described, was in one particular imitated in the clock of St. Dunstan's Church, Fleet Street, which was taken down in 1831. This remarkable clock, that projected over the street in the manner of those of several of the city churches at the present time, was set up in the year 1671. The artist, Thomas Harrys or Harris, received for his work the sum of 35*l.*, and the

old clock. It appears by the parish-books, that on May 18th, 1671, Thomas Harrys, who was then living at the lower end of Water Lane, London, made an offer to build a new clock with chimes, and to erect two figures of men with pole-axes to strike the quarters. This clock was so constructed as to afford one dial plate at the south front, and another at the east end of the church. All this he proposed to perform, and to keep the whole in constant repair for the sum of 80*l.* and the old clock; at the same time observing that his work should be worth a hundred pounds. He further adds these words: "I will do one thing more which London shall not show the like; I will make two hands show the hours and minutes without the church, upon a double dial, which will be worth your observation, and to my credit." It appears that the vestry agreed to give to Harrys the sum of 35*l.* and the old clock for as much of his plan as they thought proper to adopt; and on October 28th, in the same year, 1671, his task being completed, he was voted the sum of 4*l.* per annum to keep it in repair. We find that the idea of chimes was given up, as well as the dials at the east-end. Originally, in 1737, this clock, with its large gilt dial, was within a square, ornamented case, with a semi-circular pediment, and the tube from the church to the dial was supported by a carved figure of Time, with expanded wings as a bracket. In 1738 it cost the parish 110*l.* for repairs. Above it in an alcove, and in a standing posture, were two life-size wooden figures of "savages or Hercules," as Strype describes them, or "two wooden horologists," as Ned Ward calls them, with clubs in their right hands, who struck the quarters of every hour on the two suspended bells, moving their heads at the same time. These figures much excited

the interest of the passers-by, especially provincial visitors to London, who would stop in crowds to see these automata strike the quarters with their clubs. Leigh, in his 'New Picture of London,' calls them the "pets of cockneys and countrymen:"—

> "Many a stranger as he passed that way
> Made it once a design there to stay
> And see those two hammer the hours away
> In Fleet Street."

They were one of the sights of London, and many a gazer at them has unwittingly enriched the pickpockets and cutpurses who used to mix with the crowd of gaping idlers assembled under this clock, to the no small obstruction of the foot and carriage-way. One historian tells us that they were "more admired by many of the populace on Sundays than the most eloquent preacher from the pulpit within." A writer in the 'Mirror,' 1828, says, "It would be needless to describe the two brazen striking Saracens who attract the gaping multitude; when they perform operations one would really suppose they were in league with the pickpockets, who are below striking into the pockets of their admirers sans cérémonie." The author of 'London Scenes and London People,' an eye-witness of the old clock, says, "The giants stood in front of the building, about 30 feet from the road, on a covered platform, each wielding a club—the bell being hung between them, which at the quarters, as well as whole hours, they struck, but so indolently, that spectators often complained that they were not well up to their work. The mechanism, too, was rough and clumsy; you could not help noticing the metal cord inserted in the club, to which its motion was due." Sir Walter Scott speaks of the savages in his 'Fortunes of Nigel;' but he places

them in position before they were known to the gaping cockneys. Cowper thus alludes, in his 'Table Talk,' to these figures:—

> "When labour and when dullness, club in hand,
> Like the two figures at St. Dunstan's, stand
> Beating alternately, in measured time,
> The clockwork tintinnabulum of rhyme,
> Exact and regular sounds will be;
> But such mere quarter strokes are not for me."

In 'A Pacquet from Wells; or, a New Collection of Original Letters,' &c., 1701, we read: "A Lady of Pleasure being the Escutcheon of Iniquity, and the Cully and Pully her two Supporters, hanging thus like St. Dunstan's Clock, between Boucher and Bowden for both to knock at in their turns." When the old church was pulled down the clock and figures were purchased by the Marquis of Hertford, and removed to his villa in Regent's Park, where the clubbers still do duty every quarter of an hour. We read under date October 22nd, 1830, "Mr. Creaton, auctioneer, sold by private contract to the Marquis of Hertford the clock-tower, with its two figures, for 210*l*."

St. Dunstan's had a clock previous to 1671. It was an overhanging one, and beneath it, and in front of the church, were shops inhabited by booksellers. One of the titles to the publications issued from here reads: "Celia, containing certaine Sonets. By David Murray, Scoto Britaine, at London, Printed for John Smethwicke, and are to be sold at his shop in St. Dunstan's Churchyard, in Fleet Street, *under the Diall*, 1611," 12mo. What made the "Diall" so famous was the setting up of the giants in 1671; although so early as 1478 there was a similar piece of mechanism in Fleet Street. Stow describes a conduit erected that year near Shoe

Lane, with angels having "sweet sounding bells before them; whereupon, by an engine placed in the tower, they divers hours of the day and night with hammers chimed such an hymn as was appointed." Mr. Denham tells us that "whatever St. Dunstan's clock might have been in the first instance, it is certainly not the only device of the kind extant at the present time in England. Those persons who have inspected the curiosities at the Cathedral at Norwich will remember that the quarters for the use of persons within the building are struck by two similar, though much smaller figures, placed near two bells, inside the church in one of the recesses of the south aisle, and that the arms communicate with the abbey clock by strings, which are visible in their whole course from the figures to the ceiling." Old St. Paul's Cathedral, London, had automaton figures which struck the quarters on the clock bell, as we have before stated.

The old church dedicated to the Holy Trinity at Bristol, which was demolished in 1787, the new one of Christ Church occupying its site, had a tapering spire, and in the tower was a clock guarded by gigantic "quarter-boys," represented in two large figures, with ever-ready hammers to note the flight of time. They were similar to those formerly outside St. Dunstan's Church; and were placed under a semi-circular canopy on each side of the face of the clock. They wore brass helmets, and were partly habited in armour; each grasped a battle-axe, with which it struck the bell suspended over its head. It would appear that they were coloured and gilt with great care, according to the taste of the age. These "quarter-boys" are still preserved at Bromfield House, Brislington, in the possession of the Rev. George Weare Braikenridge.

Mechanical figures similar to those which stood at St. Dunstan's Church have lately been set up at the shop of Bennett, a watch and clockmaker, No. 65, Cheapside. There are two recesses in front of the premises, and in the upper one a figure of Time has the double duty of carrying a scythe and hour-glass, and every sixty minutes striking a large and sonorous bell. In the lower recess figures of Gog and Magog, modelled by Brugiotti from the originals in Guildhall, strike the quarters of the hour. In front of the latter recess is a large projecting clock, the illuminated dials of which make it useful by night as well as by day. Above the parapet of the house-top, about twenty feet, a ball, fifteen feet in circumference, falls every hour by an electric current transmitted from the Observatory at Greenwich.

Clocks occupy a very high place among the instruments by means of which human time is economized, and their multiplication in conspicuous places in large towns is attended with many advantages. Their position, however, in London is often very ill chosen; and the usual place, half-way up on a high steeple, in the midst of narrow and crowded streets, is very unfavourable, unless the church happen to stand out from the houses. The most convenient situation for a clock is a projecting elevation above the street, with a dial-plate on each side, like that of old St. Dunstan's Church, and that of Bow Church, Cheapside, at the present time.

The clock at Alderley is a very old and curious piece of mechanism. An inscription on it states that it was presented to the church of Alderley by the great Sir Matthew Hale:—"This is the Guift of the Right Honourable the Lord Chief Justice Heale, to the

Parish Church of Alderly. John Mason, Bristol, Fecit, Novem. 1st, 1673." It appears by this inscription to have been presented on his birthday, which from the record on his tomb was November 1st. Alderley is the family place of the Hale family to this day.

The following beautiful poem, to which no date is assigned, was written by Milton, who was born in 1608, and died in 1674; therefore probably it was composed about the period of which we are writing. Before these verses, it appears from the author's manuscript, he had written, "To be set on a clock-case."

"ON TIME.

"Fly, envious Time, till thou run out thy race;
Call on the lazy leaden-stepping hours,
Whose speed is but the heavy plummet's pace;
And glut thyself with what thy womb devours,
Which is no more than what is false and vain,
And merely mortal dross;
So little is our loss,
So little is thy gain!
For when as each thing bad thou hast intomb'd,
And last of all thy greedy self consum'd,
Then long Eternity shall greet our bliss
With an individual kiss;
And joy shall overtake us as a flood,
When everything that is sincerely good
And perfectly divine,
With Truth, and Peace, and Love, shall ever shine
About the supreme throne
Of Him, to whose happy-making sight alone
When once our heavenly-guided soul shall climb;
Then, all this earthy grossness quit,
Attir'd with stars, we shall for ever sit,
Triumphing over Death, and Chance, and thee,
O Time!"

Time and time-measurers have often furnished themes to poets and moralists, as we shall have occasion to

show in order of date. The end and purpose of clocks and watches are pre-eminently suggestive of things which relate to our inner life, measuring as they do so certainly and so continuously our steps from our cradles to our graves, our hours of joy and our hours of sorrow. Probably no mechanisms have more inspired and obtained a literature of their own than time-measurers, which have in all ages since their invention offered an almost inexhaustible theme for poets and moralists. The mottoes that have appeared on old sundials—those antique Altars of Time—would fill a small volume. One other example, which we may fit in here, is given by Dryden, who was born in 1631, and died in 1701, and who, alluding to the death of King Polybus, says in his 'Œdipus,'

> "Till like a Clock worn out with eating Time,
> The wheels of weary Life at last stood still."

During the seventeenth century there was a great taste for striking-clocks, which were to be had in every variety of form. Several of them, made by Thomas Tompion, who invented many useful things in clock-work, not only struck the quarters on eight bells, but also the hour after each quarter. At twelve o'clock forty-four blows were struck, and one hundred and thirteen between twelve and one o'clock. Failures in the striking mechanism of these clocks were attended with much annoyance to the owners of them; for they would go on striking without cessation until the weight or spring had gone down, and they were frequently contrived to go for a month. A clock made by Tompion on this construction caused much annoyance to the Duchess of Gloucester soon after her marriage. This machine was fixed in an apartment adjoining her

bedchamber; the failure took place at two o'clock in the morning, and, as the case could not be opened, the clock continued to strike until eight o'clock—a tintinnabulum which we think must have scared away the hovering Hymen from the bridal bed.

In June, 1826, a discovery was made of the *chef-d'œuvre* of Tompion, which had been so long lost. It was made for the Society for Philosophical Transactions, and was a year-going clock. A record exists which states that Tompion was at work on this clock when the great plague broke out in London; and on the day that he finished it he was attacked by the pestilence. His friends removed him to the Continent, where he died. On the dial was this inscription: "Sir James Moore caused this movement to be made with great care, anno Domini 1676, by Thomas Tompion." Tompion was paid one hundred guineas, and the clock was removed to the Society's house, and there in the confusion of the moment it was placed in the lumber room, where it lay without a case exactly a century and a half. One thing wonderful attended this discovery, namely, that all the steel pins on being cleared from dust were found to be as brilliant as ever they had been. The above statement as to Tompion's death seems to be hardly consistent with the following advertisement, which appeared in 'Mercator,' No. 79, 21-4 Nov., 1713:—"Advertisement. On the 20th instant, Mr. Tompion, noted for making all sorts of the best clocks and watches, departed this life. This is to certify to all persons, of whatever quality or distinction, that William Webster, at the 'Dial and Three Crowns,' in Exchange Alley, London, served his apprenticeship, and served as a journeyman a considerable time with the said Mr. Tompion, and by his

industry and care is fully acquainted with his secrets in the said art."

At Windsor Castle is an old clock, which was made by Joseph Knibb in 1677. This artist issued the following token:—Obverse—IOSEPH KNIBB CLOCK-MAKER IN OXON (in four lines). Reverse—I. K.—A clock face and hands. It seems that clockmakers, like other tradesmen, issued their tokens in the seventeenth century. We find two further examples of this coinage still preserved:—Obverse—HENRY BORGIN—A clock face and hands. Reverse—WITHOVT BISHOPS-GATE H. M. B. Obverse—WILL BRVNSLEY AT LILLY—A clock face and hands. Reverse—HOVSE AGAINST STRAND BRIDG HIS HALFPENY.

Many curious clocks were made in the seventeenth century by Nicholas Grollier de Servière, who was born at Lyons in 1596, where he died in 1689, after an eventful life. At the age of fourteen he was a soldier, and served in the army in Italy, and lost an eye at the siege of Verciel. He was also present at the battle of Prague, where he greatly distinguished himself. His knowledge of mathematics and mechanics enabled him to render much help to his country during the memorable sieges of the time of Louis XIV. After many adventures he retired from service, and found leisure to invent and manufacture many curious clocks and ingenious toys. In one of his clocks time was measured by the descent of a ball in a metal groove, twisted round columns supporting a dome. When the ball finished its descent, its weight, lifting a detent, discharged the wheelwork, giving motion to an Archimedian screw, which raised the ball to its former position, again to descend as before. In another the ball descended in diagonal lines on an inclined plane. The

means of ascent in this case were hidden from view In a third the ball was made to pass within the bodies of two serpents, which by a reciprocating motion were made to swallow the ball alternately. A compound of the motions in the two last-named clocks was adopted by a scientific gentleman about fifty years ago, and time-pieces on this principle are still called Congreve clocks after him. Grollier made several clocks for the purpose of pleasing and surprising his visitors.

Thus, a small figure of a tortoise dropped into a pewter-plate filled with water, having the hours marked on the flat edge, would float round and stop at the proper hour. If moved it would again return; and if the tail were placed at the hour it would turn round, and again point with its head. A lizard was seen ascending a pillar on which the hours of the day were marked, and pointing to the time as it advanced. The figure of a mouse was also made to move on a cornice, and point to the hours marked upon it. These contrivances were in part managed by concealed magnets, which were sufficiently strong to attract, although covered over. Grollier also contrived a method for showing the time at night, by causing the dial of a clock to revolve instead of the hands. By these means the hours and quarters were brought to an illuminated space and seen together; the quarters being differently marked, and engraven on a smaller circle than the hours. The inventor stated that these clocks were less expensive and less liable to derangement than repeating-clocks, and that none but the blind would prefer repeaters to them; it being easier to look at the one than to pull the cord of the other. Grollier made some clocks to go by their own weight, descending inclined planes, and others in grooves, forming a kind of path

from the ceiling to the floor. When the clock had nearly finished its descent it was lifted off, and placed again at the highest point of its path, the hands being set to time before it was restarted. Several clocks on this principle have been projected to avoid the casualties to which main-springs and weight-lines are liable. Such a clock, invented and made by the Rev. Maurice Wheeler, was exhibited about eighty-five years ago at Don Saltero's museum of rarieties at Chelsea, which was one of the popular sights of London at the close of the last century. One of these clocks, invented by M. de Gennes, was kept in equilibrium by a weight at the end of a lever. The unwinding of the springs made the weight change its position; thus altering the centre of gravity, and causing the clock to ascend the plane.

At a meeting of the Archæological Institute, held on February 6th, 1852, Mr. Forrest exhibited a travelling or table clock, in the form of a large watch; the date being about 1690, and the maker, John Rehle, of Freiburg.

A curious satirical poem, published in 1690, and entitled 'Mundus Muliebris: or, the Ladies' Dressing Room unlocked, and her Toilette spread,' mentions, as part of a fashionable lady's paraphernalia—

> "Repeating-clocks, the hour to show
> When to the play 'tis time to go."

In 1696, William Derham, D.D., F.S.S., Canon of Windsor, and a most eminent philosopher and divine, who was born near Worcester in 1657, and died in 1735, published 'The Artificial Clockmaker, or, a Treatise of Watch and Clockwork; showing to the meanest capacities the art of calculating numbers to all sorts of movements, the way to alter clockwork to make chimes, and set them to musical notes, and to cal-

culate and correct the motion of pendulums. Also numbers for divers movements, with the ancient and modern history of Clockwork, and many instruments, tables, and other matters never before published in any other book.' This work was republished in 1700. A fourth edition with large emendations appeared in 1734; and a new edition in 1759.

About the year 1696 Burdeau, a clever mathematician, constructed a remarkable clock in compliment to Louis XIV., whom in this ingenious work he highly flattered. On a rich throne, surrounded by all the pomp of royalty, was seated "le grand Monarque;" around him stood the Electors of the German States, and the princes and dukes of Italy. These advanced towards the king, and, after doing homage, on retiring chimed the quarters of the hour with their canes. For the kings of Europe was reserved the more dignified office of striking the hours, after having paid their respects to the king. This piece of automaton clockwork was very gratifying to the French people of the time of Louis XIV.; and many who admired it persuaded the maker to exhibit it publicly. Unfortunately for Burdeau, he advertised his intentions to do so in the newspapers, and attempted too much in order to gratify the great crowd of people which collected in consequence. Knowing the stubborn and unyielding will of William III. of England towards his sovereign, the artist determined to make William's effigy more pliant, so that when its turn came, it should make a very humble obeisance to Louis. William, thus compelled, bowed very low indeed; but at the same instant some part of the machinery snapped asunder, and threw "le grand Monarque" prostrate from his chair at the feet of the British king. The news of the accident spread in every

direction as an omen; the king was informed of it, and poor Burdeau was confined in the Bastile.

In the palace of Versailles, in the Salon du Conseil, is a curious clock, that plays a chime when the hour strikes, and is set in motion by machinery, by which also sentinels are made to advance, a cock to flap his wings, Louis XIV. to come forward, and a figure of Victory or Fame to descend from the skies and crown him with a golden chaplet. The Salle des Pendules in this palace is so called from a clock in it, which shows the days of the month, the phases of the moon, the revolutions of the earth, and the motions of the planets, besides the hour, the minute, and the second of the day. We may here mention incidentally that French clock cases were formerly accounted the first in the world, and those made by Boule in the time of Louis XIV. are looked upon as curiosities of good taste and workmanship.

In 1820 appeared the following advertisement:—"Mechanical Clock. The Proprietors of an elegant and superb Mechanical Clock, 8 feet high, which was the property of Maria Antoinette, late Queen of France, have the honour to present it for the inspection of the public: this piece of mechanism represents the front view of the king's palace at Versailles (the garden side): on the commencement of striking the hour a complete and beautiful clockwork begins playing 20 different airs, after which a figure, representing the Warner of Death, makes its appearance in the centre of the balcony, at each side of which is a King's Herald in a sitting position, holding the shell of a clock in their hands, to which the figure moves alternately with a majestic step, striking the hour, and then retires; immediately after 5 doors in the balcony open, and

out of the centre his Majesty Henry IV. makes his appearance by announcement of trumpets by figures at each side of the balcony, when the doors close again and leave his Majesty in a standing position, surrounded by his suite; then an angel from the top, with a crown in his hands, appears, in the midst of music by different instruments, placing the crown on the head of the monarch, with a brilliant star hovering over his head; at the conclusion of the coronation and music the trumpets recommence sounding, when his Majesty salutes the public and retires with his suite, and the doors immediately close: the dial of this incomparable piece of mechanism represents the different movements of the globe, the sun, moon, and planets, showing the leap year by the months, weeks, days, hours, and minutes, with the 4 seasons; the whole of which is regulated by the movements of this extraordinary mechanical clock. At the same place may be seen also the Cuirass of his late Majesty the Emperor Napoleon, with the Cuirass and Helmet of his son, the King of Rome; and many other new invented cuirasses. All the objects are to be sold, and are on view at No. 23, Howland Street."

In the court called the Cour de Marbre, at Versailles, was a clock that had no mechanism, and only one hand, which was placed at the precise moment of the death of the last King of France, and which did not move during the whole of his successor's reign. This custom dated from the time of Louis XIII. It was a fitting memorial for a palace, to remind the inmates of their brief tenure of office. In 1838 this "clock of the King's death" was replaced. In the imperial chateau of St. Cloud, in the Salon de la Réception de la Reine, is a clock with twelve dials, marking the hours of as many capitals of Europe.

CHAPTER IV.

Equation Clock — Mean Time — Clock at Warwick — Clocks in South Kensington Museum — Rochester Clock — Bishop Burnet's Gifts of Clocks — Prior's Verses on a Clock — Bishop Hall's Clock — Christopher Pinchbeck and his wonderful Clocks — Cripplegate Clock — Transit Clock — Sidereal Time — George Graham — Improvements in the Pendulum — Hogarth's Masquerade Clock — Clock Lamp — Bampton Clock — Musical Clocks — Clocks at Knole — Automaton telling the Hours — Musical and Astronomical Clock — Derby Clock — John Whitehurst — Clock Inscriptions — Marquis of Worcester's Ball Clock — Night Sand Clock — York Cathedral Clocks — John Ellicott — Horse Guards Clock — The Escapement of a Clock — Infants' Nursery Clock — Repeating-Clocks — Vocal Clock — Colonel Magniac — Clock at Royal Academy, Paris — the Microcosm — Young's Reference to Horology.

THE first Equation Clock, an ingenious contrivance to show both mean and apparent time, was made in London between one hundred and fifty and two hundred years ago. The first one invented was in the cabinet of Charles II., King of Spain, and is thus described in a letter from Father Kresa, a Jesuit, to Mr. Williamson, a watchmaker:—"I have to tell you that from the years 1699 to 1700 there has been in the cabinet of King Charles II., of glorious memory, King of Spain, a clock with a royal pendulum (seconds pendulum), made to go with weights and not with springs, going four hundred days without requiring to be once wound up . . . I had orders to go every day to the palace during several months to observe the said clock and compare it with the sundial; and at that time I remarked that it showed the equation of time equal and apparent, exactly according to the tables of Flamstead."

In the 'Philosophical Transactions,' 1719, is a letter by Joseph Williamson, a watchmaker, asserting his right to the curious invention of making clocks to keep time with the sun's apparent motion. The principal artists who were employed in the making of clocks to show not only mean but also apparent time, a more curious than useful part of horology, were Sully, Father Alexander, Le Bon, Le Roy, Kriegseissen, Enderlin, L'Admiraud, Passement, Rivar, and Graham. The difference between the hour shown by the sundial and by a correct clock is called the equation of time. In order to obviate the inconvenience produced by this irregularity, astronomers imagine a fictitious sun, coming to the meridian as much before or after the real sun as the equation of time is after or before noon, and as this fictitious sun is supposed to move in a course that is the average, or mean, of all the irregularities in the motion of the real sun, it is called the mean sun, and the time it indicates mean time. An astronomical clock is one contrived to show the apparent daily motions of the sun, moon, and stars, with the times of their rising, setting, and the like. The reader will remember that the motions of the sun and stars round the earth are only apparent, and are produced by the real motion of the earth in rotating upon its axis, which motion is uniform and unvariable.

In the church of St. Mary, Warwick, which has a set of tuneful chimes, is a large wooden clock, fixed to the wall on one side at the west end, showing the day of the month, as well as the time of the day. Upon its smartly painted face are the arms of Queen Anne, and her motto, "Semper Eadem" (Ever the Same); and also the admonition, "Vigilate et Orate" (Watch and Pray).

In the South Kensington Museum is an upright clock, the case of which is richly inlaid with marqueterie scroll-work. The dial is marked "Henry Poisson, London." The height of the clock is eight feet three inches and a half. It is of the period of Queen Anne; and it was purchased for 12*l*. In the same museum is a clock in the form of a globe, supported by three bronze amorini. It is of French work, about the year 1700. The height is three feet eight inches and three-quarters; and the diameter, two feet. It was purchased for 150*l*. Mr. G. H. Morland has a clock mounted on a truncated column of ormolu, with a globe and mathematical instruments. It is of French manufacture, and of the eighteenth century. It has been exhibited in the above-named museum. In that national collection is also a clock, the case of which is in old Florentine porcelain, surmounted by a figure of Time. The dial is surrounded by a wreath of olive leaves in ormolu. The height is two feet six inches. This clock is of the eighteenth century, and was purchased for 18*l*. Also an old French clock, in an ormolu case. It is of the period of Louis XIV. The dial is inscribed "Thuret, à Paris." The height is twenty-two inches. The clock was purchased for 15*l*.

The clock-house at Rochester, which occupies the site of the ancient Guildhall, was built at the sole charge of Sir Cloudesley Shovel, in the year 1706. The clock was also the gift of that distinguished Admiral.

The will of Bishop Burnet, dated October 24th, 1711, contains the following items of clocks and watches belonging to him:—"The clock in the parlour at Salisbury;" "my repeating-watch;" "the clock in the room before my study in Salisbury;" "the repeating-

table-clock tipt with silver;" and "the clock in the parlour at St. John's."

Again we have occasion to introduce a bit of morality upon the subject of horology. Prior, who was born in 1644, and died in 1721, thus wrote:—

> "So, if unprejudic'd you scan
> The goings of this clockwork man;
> You find a hundred movements made
> By fine devices in his head;
> But 'tis the stomach's solid stroke
> That tells this being what's o'clock."

A correspondent of 'Notes and Queries,' of September 16th, 1865, says:—"Some four or five years since, on entering a loft in a coal-wharf in this town (Bodmin), my attention was drawn to an antique clock silently standing on a bracket, and begrimed with dust and dirt. It was without a case; the pendulum and weight uncovered like a Dutch clock; the bell formed a dome above. It had the inscription 'William Allmand in Loutheberry fesitt.' The grimy tenant of the loft told me that it was the property of his employer, and that it went by the name of 'Bishop Hall's clock.' On account of its ancient look, I bought it of the owner, and received with it the following history. It was formerly in the possession of the Rev. Robt. Walker, of South Winnow, in Cornwall, and was valued by its owner as 'Bishop Hall's clock.' After Mr. Walker's death, his household goods were sold, and this clock was then purchased by the coal-merchant. I subsequently found that this Mr. Walker was a descendant of Hall, the famous Bishop of Exeter, and afterwards of Norwich."

On the west side of St. John's Lane, Clerkenwell, is situated Albion Place, which was erected in 1822, on the site of an old court, called St. George's Court, which

was then pulled down. Here in 1721 lived Christopher Pinchbeck, the discoverer of an ingenious alloy of metals, closely resembling gold, which was named after him, "Pinchbeck," and the inventor of "astronomico-musical clocks." He appears to have excelled in the construction of musical automata, which on several occasions he exhibited in a booth at Bartholomew Fair; and in conjunction with Fawkes, the conjuror, at Southwark Fair. He made a musical clock for Louis XIV. of France, which is said to have been an exquisite piece of workmanship, and worth about 1,500*l*. He also made a fine organ for the Great Mogul, worth 300*l*. He died on November 18th, 1732. From the following advertisement, which appeared in 'Applebee's Weekly Journal,' of July 18th, 1721, it appears that Pinchbeck removed from Clerkenwell to Fleet Street about that time:—

"Notice is hereby given to Noblemen, Gentlemen, and Others, that Chr. Pinchbeck, Inventor and Maker of the famous Astronomico-Musical Clocks, is removed from St. George's Court, St. Jones's Lane, to the sign of the 'Astronomico-Musical Clock' in Fleet Street, near the 'Leg' Tavern. He maketh and selleth Watches of all sorts and Clocks, as well for the exact Indication of Time only, as Astronomical, for shewing the various Motions and Phenomena of planets and fixed stars solving at sight several Astronomical problems, besides all this a variety of Musical performances, and that to the greatest Nicety of Time and Tune with the usual graces; together with a wonderful imitation of several songs and Voices of an Aviary of Birds so natural that any who saw not the Instrument would be persuaded that it were in Reality what it only represents. He makes Musical Automata or Instruments of themselves

to play exceeding well on the Flute, Flaggelet, or Organ, Setts of Country dances, Minuets, Jiggs, and the Opera Tunes, or the most perfect imitation of the Aviary of Birds above mentioned, fit for the Diversion of those in places where a Musician is not at Hand. He makes also Organs performing of themselves Psalm Tunes with two, three, or more Voluntaries, very Convenient for Churches in remote Country Places where Organists cannot be had, or have sufficient Encouragement. And finally he mends Watches and Clocks in such sort that they will perform to an Exactness which possibly thro' a defect in finishing or other Accidents they formerly could not."

The following note was made by George Vertue, the celebrated engraver:—"On Thursday evening, Oct. 4, 1722, being in company, and some talking of curiosities in art, mentioned a fine and curious clock made by Pinchbeck, which, with a small movement or touch, could play many and various sorts of tunes, imitating many sorts of instruments, several birds, &c., the music being just, regular, and tuneable, and the time well observed."

A mezzotinto portrait of Christopher Pinchbeck, by Faber, from a painting by Wood, represents him with an open watch in his hand. His portrait was also published in his shop-bill, oval, folio. His son appears to have carried on his father's business; for, in the 'Daily Post' of July 9th, 1733, appeared the following advertisement:—"To prevent for the future the gross Imposition that is daily put upon the Publick, by a great Number of Shopkeepers, Hawkers, and Pedlars, in and about this Town, Notice is hereby given, That the ingenious Mr. Edward Pinchbeck, at the Musical Clock in Fleet-street, does not dispose of one Grain of his curious

Metal, which so nearly resembles Gold in Colour, Smell, and Ductility, to any Person whatsoever; nor are the Toys made of the said Metal sold by any one Person in England except himself; therefore Gentlemen are desired to beware of Imposters, who frequent Coffee Houses, and expose to Sale Toys pretended to be made of this Metal, which is a most notorious Imposition upon the Publick. And Gentlemen and Ladies may be accommodated by the said Mr. Pinchbeck with the following curious Toys, *viz.* Sword Hilts, Hangers, Cane Heads, Whip Handles for Hunting, Spurs, Equipages, Watch Chains, Coat Buttons, Shirt Buttons, Knives and Forks, Spoons, Salvers, Tweezers for Men and Women, Snuff Boxes, Buckles for Ladies' Breasts, Stock Buckles, Shoe Buckles, Knee Buckles, Girdle Buckles, Stock Clasps, Necklaces, Corrals. And in particular Watches, plain and chased, in so curious a Manner, as not to be distinguished by the nicest Eye from real Gold, and which are highly necessary for Gentlemen and Ladies when they travel; with several other fine Pieces of Workmanship of any Sort, made by the best Hands. The said Mr. Pinchbeck likewise makes Astronomical and Musical Clocks; which new invented Machines are so artfully contrived as to perform on several Instruments great variety of fine Pieces of Musick, composed by the most celebrated Masters, with that Exactitude, and in so beautiful a Manner, that scarce any Hand can equal them. They likewise imitate the sweet Harmony of Birds to so great a Perfection as not to be distinguish'd from Nature itself. He also makes Repeating, and all other Sorts of Clocks and Watches; particularly Watches of a new Invention, the Mechanism of which is so simple, and the Proportion so just, that they come nearer Truth than any others yet made. He also

mends all Sorts of Clocks and Watches, Musical Machines, and Pieces of Machinery whatsoever, after so just a Manner, that they shall go well tho' they never did before." At the top of this advertisement is a rude woodcut, representing a table-clock.

In the Historical Chronicle of the 'Gentleman's Magazine' of June, 1765, we read, that on May 4th, in that year, Messrs. Pinchbeck and Norton set up at the Queen's House a new clock with four faces, which was greatly admired. The first and principal face showed the true and apparent time, with the rising and setting of the sun every day in several parts of the world, by a moving horizon; the second front showed the motions of the planets in their orbits, according to the system of Copernicus; the third, the age and different phases of the moon, with the time of the tide at thirty-two different seaports; and the fourth, by a curious retrograde motion in a spiral, showed every day of the month and year, with the months and days of the week in proper emblems.

The steeple of Cripplegate Church contains a clock, which presents one face to the east and another to the north. It was made by Lang Bradley in the year 1722, and was thoroughly repaired in 1797 by William Dorrell, of Bridgewater Square, and made to strike the hour on the tenor bell. In 1846 it was again repaired by Thwaites and Reid, and the pendulum was lengthened. This clock is now considered to be one of the best in London. A former alderman, Sir William Staines, among his other munificent gifts to the parish, presented a small and inharmonious bell, upon which the clock strikes a note, discordant to the peal. The chimes, which are almost without a rival, were constructed in 1792 by George Harman, of High Wycomb,

Bucks, and play seven tunes, changing the tune daily at noon. They were thoroughly repaired in 1849, when the tunes were rearranged, and those of inferior melodies taken off, and others substituted.

Clocks have been applied to other purposes than the mere simple measurement of time. George Graham, an eminent horologist, of whom further mention will be made presently, applied the movement of a clock, showing sidereal time, to make a telescope point in the direction of any particular star, even when below the horizon. In Greenwich Observatory was set up a curious transit clock, made by Graham, but greatly improved by Earnshaw, who so simplified the train as to exclude two or three wheels, and also added cross-braces to the gridiron pendulum, by which an error of a second per day, arising from its sudden starts, was corrected. Sidereal time, or star time, is that which is obtained by the observation of the transit of stars over the meridian, and, as it depends upon the rotary motion of the earth alone, and is uninfluenced by the irregularities of orbital motion, it is subject to no variation, and is consequently most uniform. But there is a considerable difference between solar and sidereal time, the sidereal day being four minutes shorter than the solar day.

In the 'Philosophical Transactions' of 1726 is an account of a contrivance to avoid the irregularities in a clock's motion occasioned by the actions of heat and cold on the pendulum rod, by George Graham. And here we will explain that a pendulum in order to maintain at all times an invariable rate of vibration must always remain of an invariable length; but because the changing temperature of the atmosphere alternately lengthened and shortened the pendulum, by the effects

of expansion and contraction on the materials of which it was composed, it became necessary so to construct it that while the expansion of one part would make it longer, the simultaneous expansion of another part would make it shorter, and the two antagonistic expansions thus compensating each other, the same length would be maintained at all temperatures, the effects of contraction being corrected in the same manner. A number of methods, some of which Graham invented, have been used, with more or less success, for effecting this object. Graham was an ingenious mechanic, and a most accurate clock and watch maker. He was born in Cumberland in 1675, and died in 1751. The following obituary notice of him appeared in the 'Daily Advertiser' of November 18th, 1751:—"Saturday Evening, died suddenly, at his House in Fleet Street, Mr. George Graham, not less known in the learned World, than in that Branch of Business to which for many Years he had so successfully applied himself, as by his uncommon Ingenuity to have acquired the Reputation of being the best Watchmaker in Europe. He was many Years Fellow and one of the Council of the Royal Society. His Apparatus, made for measuring a Degree of the Meridian in the Polar Circle, is greatly esteemed among the Literati; as are also his many curious Instruments for Astronomical Observations. He lived beloved, and died universally lamented." Graham's portrait, engraved by Faber in mezzotinto after Hudson, represents him sitting with his hat on his knees. Another portrait engraved by Ryley was published in 1820, by Laurie, of No. 53, Fleet Street, after an original picture in the possession of the Earl of Macclesfield.

In 1727 William Hogarth published a satirical print called the 'Masquerade Ticket,' on the top of which

was a clock, that is thus described in John Ireland's 'Hogarth Illustrated,' in which it is represented (*vide* also the 'Mirror,' vol. xi., p. 377): "The head of the renowned Heidegger, master of the mysteries and manager in chief, is placed on the front of a large dial, fixed, lozenge fashion, at the top of the print, and, I believe, intended to vibrate with the pendulum; the ball of which hangs beneath, and is labelled Nonsense. On the minute finger is written Impertinence, and on the hour hand Wit; which seems to intimate, nonsense every second, impertinence every minute, and wit only once an hour! The time is half-past one—the witching hour of night. Seventeen hundred and twenty-seven, the date of the year this print was published, is on the corners of the clock. Recumbent on the upper line of the print, and resting against the sides of the dial, the artist has placed our British lion and unicorn renversé (such, I think, is the term in Heraldry), lying on their backs, and each of them playing with his own tail. The lion sinister, and the unicorn dexter, the supporters of our regal arms, being thus ludicrously introduced, may, perhaps, allude to the encouragement King George the Second gave to Heidegger, who at that period might be said to 'teach kings to fiddle, and make senates dance,' who, by thus kindly superintending the pleasures of our nobles, gained an income of 5,000*l.* a year, and, as he frequently boasted, laid out the whole in this country. Under the clock, Hogarth delineated the scene of a masquerade."

In 1730 appeared the following advertisement of a clock-lamp: "Walker's new invented Clock Lamp, which not only far exceeds any Lamp hitherto invented both as to its Neatness in the using (it neither daubing the Fingers at all in the Dressing, nor making any

Daub where it stands, as others do) as well as in the clear continued Light it gives from the first lighting of it till all the Oil is quite spent, without so much as once snuffing it the whole Time; but it likewise shews the Hours of the Night exactly as they pass, from the Time of going to Bed till the next Morning; or, from the Time of lighting the Lamp till it is quite burnt out, supplying, at once, the Place of a Clock or Watch and Candle, when used with proper Oil, which is sold with the Lamps, wherein it is entirely, and beyond all others; and, being conveniently placed by the Bedside, one may lie still in Bed and see how the Time passes. Sold only by John Walker, removed from Fleet Street to the White Horse and Bell, near Cheapside Conduit; where is also sold all sorts of Brazier's and Ironmonger's Goods and the newest fashion'd French Plate very cheap, he being the Maker." This artist appears to have had a formidable rival in trade; for we find the following advertisement appearing in 1731: "Ashburne's New Invented Clock-lamp, shewing the Hours of the Night, exactly as they pass, far exceeding anything of this Kind ever yet invented. To be sold Wholesale or Retale by the Inventor and Maker, Leonard Ashburne, at the Sugar Loaf in Pater Noster Row, next Cheapside; at Mr. Cole's, at the Rainbow and Dove in Chancery Lane, next Fleet Street; at Mr. Noon's, at the White Hart in the Poultry; at Garraway's Old Shop, the South entrance of the Royal Exchange; and at Mr. Taylor's, a China Shop, over against St. Alban's Street in Pall Mall. Where likewise are Sold, All Sort of Chamber Lamps, in the greatest Variety, which have given the Publick a general Satisfaction. With Oil fit for the Purpose. Whereas a malicious and ill designing Advertisement was set forth by the Lamp Pretender in

Cheapside in the Craftsman of Saturday last, and in the Daily Post of Wednesday the 6th Inst. wherein he calls those Lamps sold in Pater Noster Row counterfeit, &c., which any Person on View will find to be false and malicious, endeavouring thereby to lessen the Character and Reputation which they have gain'd beyond all others, notwithstanding his imposing on the Publick, as being the Maker, and now within this Week stiles himself the Inventor, when he knows, as do many others, that they were made long before he was concerned in them. And as for counterfeiting them, I desire that all persons that shall have any Occasion, will do themselves the Justice to see both sorts, before they will be imposed on by such a base and ill designing person." At the top of this advertisement is a rude woodcut, representing four lamps, one of which is somewhat like a coffee-pot in shape; the others are formed like vases; and in all, the part which holds the wick projects from the side of the lamp.

In the vestry books of Bampton, Oxfordshire, is the following entry, under date January 27th, 1733:—"At a vestry this day held, and application being made to the said vestry by John Reynolds, of Hagbourn in the county of Berks, blacksmith, for payment of the sum of thirty-four pounds, due to him for making a new clock and chimes in the parish church of Bampton, he having performed his said work according to his agreement, and to the satisfaction of this vestry, therefore it is ordered by this vestry, that the churchwardens of this parish for the time being do forthwith pay unto the said John Reynolds the said sum of 34*l.*, according to agreement of this vestry for that purpose, except 40 shillings, which is to be left as a caution till the clock is further proved." Bampton Church Tower now

contains a large clock, which, when it strikes, is heard to a considerable distance. There are also chimes, which play an ancient carol, at the hours of one, five, and nine.

During the eighteenth century musical and automaton clocks were much in fashion. In addition to those which we have before referred to, we may mention the following. In Bagford's Collections, Harl. MSS., 5946, in the British Museum, is this advertisement:— "The celebrated musical clock, approved of by the greatest quality in this kingdom, which, besides divers curious motions, performs, 1. A Consort of Italian and English music, either single, or in parts, to the number of 32 different tunes, including sets of airs, minuets, jiggs, borees, sarabands, courants, &c., on organs, trumpets, flutes, and flagellets, very true and melodious. It shifts a fresh tune of itself, and repeats at pleasure. 2. In the course of this harmony, the seven liberal sciences, *viz.* Musick, Optick, Physick, Architecture, Painting, Mathematicks, and Eloquence, appear, each with some proper instrument to denote her profession. 3. Apollo breaks through a cloud with his harp in his hand. 4. A cuckoo calls, and 17 small birds warble their proper notes as natural as if living. Its model is exact and regular, and adorned with a vast number of curious carved and gilded figures, with the Queen under a triumphal arch, the pedestal the same as at St. Paul's, and many other curiosities. To be seen at the 'Duke of Marlborough's Head' in Fleet Street, from nine in the morning till eight at night. To be sold for 700 guineas, or raffled for at five guineas per ticket." The King of Spain, before the French revolution had a clock, which played one hundred tunes loudly like a full band. The bottom part was a large stand; above on a pedestal were three ormolu

figures, about four feet high; on the top was a large globe representing the earth, which moved so as to display the diurnal and also the annual motion of the world. This clock came into the possession of a Madame Beauzalie, of Paris, who asked a very large price for it. There is a musical clock at Knole, Kent, with a bird at the top of it, which sings and flaps its wings. At the same place is also a fine clock, which was presented by Louis XVI. to Lord Whitworth, the second husband of the Duchess of Dorset. While mentioning Knole we may add that the out-of-doors clock there formerly stood on a dome, similar to that at Lambeth Palace, over the Hall; but the roof of that room appearing to bend under it, it was taken down in 1745, and removed to its present situation.

In 1740 appeared the following advertisement of an automaton which told the hours, &c.:—"This is to give Notice, To all Gentlemen, Ladies, and others. That the three surprising Mathematical Statues, which has lately been shown before the Vice-Chancellor and the rest of the University at Oxford, with universal Applause, &c. The first Statue represents a Country Lass, with a Pidgeon upon her Head, holding a Glass in her Hand, which she lifting up, makes to run out of the Pidgeon's Bill, either Red or White Wine. The second represents a Merchant Grocer in his Shop, who at the Word of Command, opens and shuts his Door himself, and brings Sugar, Tea, Coffee, and all Sorts of Spices. The Third Statue represents a Blackmoor holding a Hammer in his Hand, having a Bell before him, and as soons as commanded performs as follows, *viz.* 1. He strikes the Day of the Week, and the Hours. 2. Four Spectators may each of them draw a Card, and he will not only shew how many spots are upon such a Card,

but also the Colour of the Card. 3. Any of the Spectators may call for any Number under 12 in his Mind, and the Blackmoor will strike it. With many other Actions too tedious to mention. To be seen from Ten in the Morning until Eight in the Evening, at the End of Wine Office Court in Fleet Street. Price 1*s*."

On July 15th, 1740, appeared the following descriptive advertisement of a musical and astronomical clock:—"Now open'd, the Athenian Temple of Arts and Sciences, consisting of a great Variety of fine Performances in Musick and other Arts, being the Produce of a large Expence and Ten Years Labour and Study, is now finish'd, and is humbly offered to the Ingenious and Polite, and to all true Lovers of Arts and Sciences, of both Sexes, for their Approbation, and is to be seen and heard, 'till Sold, in the North Isle of the Royal Exchange, at 2*s*. 6*d*. each Person. The Description. This Piece of Machinery is in Form of a Roman Temple, made of Mahogany, finely Embellish'd with Emblematical Carve Work gilt, and fine Poetical Paintings. The upper Part is a Dome, supported by 24 Columns, in the Concave of which is a Ball, representing the Sun, with his Six Planets moving round him in proportionable Periods of Time; underneath which is the Statue of Euclid turning round and commanding 12 Emblematical Figures, each performing their several Motions. In the first Front there are four Sets of Keys for the Practice of the Science of Musick, and a curious Piece of Painting over ditto. In the second Front is the Representation of Day by Phœbus, driving the Night before him when he rises. In the third Front are several Scenes of fine moving Paintings, &c., by Clockwork. In the fourth Front is a Scene of Painting, representing Night, which moves

off, and you discover a curious Clock that performs a fine Air, or Piece of Musick, at set Hours, or at Pleasure. The Clock is of a new Invention, finely embellish'd, and solves many and curious Problems relating to Astronomy, the Particulars of which are too many to be express'd in this narrow Compass. This Piece of Machinery performs many delightful Pieces of Musick upon the full Organ by Clockwork. The Entertainments of Persons with the Performance of this Grand Temple, will begin at 11, 12, 3, 4, 5, 6 of the Clock every day. Note, Any select Company may be privately entertain'd at any Hour separate from the Time above."

John Whitehurst, of Derby, writing in 1847, says:— "The escapement alluded to in my specification (for the Westminster clock) is now keeping time in a church clock in the neighbourhood. It is the very best for large turret clocks that I know of in all my many years' experience. There is one of the same escapements in All Saints Church clock, Derby, made by my late great-uncle, John Whitehurst, F.R.S. The clock was made by him A. D. 1745, and the clock is now going to time most admirably. I have made a number of large turret-clocks with the same escapement, and they invariably keep excellent time." John Whitehurst, an eminent philosophical and mechanical genius, having settled at Derby as a watchmaker, made the clock and chimes of the beautiful tower of All Saints Church as above mentioned. From his vicinity to the many stupendous phenomena in Derbyshire, which were constantly presented to his observation, he was excited to investigate their causes. Being appointed stamper of the money weights in 1775, he removed to London, where he soon after published his 'Enquiry into the

Original State and Formation of the Earth,' which will remain a monument of his fame to future ages. Particulars of his, and of another watchmaker's, business relations with Wedgwood, in his pottery art, will be found in Miss Meteyard's 'Life of Josiah Wedgwood.' He died in 1788, at his house in Bolt Court, Fleet Street, where Mr. Ferguson, another celebrated self-taught philosopher, had then recently lived and died. His death was universally lamented.

The 'Gentleman's Magazine' for December, 1746, tells us that the following was the inscription on a clock belonging to Mr. H——s, at H—ll—ns, in Yorkshire, in that year:—

"I serve thee here, with all my might,
To tell the hours by day, by night:
Therefore example take by me,
To serve thy God, as I serve thee."

Similar lines were posted on his house-clock by the Rev. John Berridge, Vicar of Everton, who was born in 1716, and died in 1793, and whose name is familiar to those who know the history of the revival of evangelical religion in England in the last century:—

"Here my master bids me stand,
And mark the time with faithful hand;
What is his will is my delight,—
To tell the hours by day and night.
Master, be wise, and learn of me,
To serve thy God as I serve thee."

The following lines, which are inscribed under the clock in front of the town-hall in Bala, Merionethshire, are in part like the above:—

"Here I stand both day and night,
To tell the hours with all my might;
Do you example take by me,
And serve thy God as I serve thee."

Over the market clock at Terni is this moral notice:—"Hora, dies, & vita fugit, manet unica Virtus."

"Hours, days, and ages fly away;
Virtue alone knows no decay."

Early in the present century there was in the town of Tetbury, Gloucestershire, a very ancient market-house, in front of which was a clock with a very curious and elaborately carved oaken dial-plate, with this motto:—"Præstant æterna Caducis."

Under or above the dial of the parish clock of Market Harborough, in Leicestershire, appears the excellent injunction:—"Begone about your business."

The 'Gentleman's Magazine' for 1748 tells us of a machine which was suggested by the Marquis of Worcester, and which was to make a ball of any metal, when thrown into water, presently rise from the bottom, and constantly show by the superficies of the liquid the hour of the day or night; never rising more out of the water than just to the minute it showed of each quarter of the hour; and if by force the ball should be kept under water the time was not lost, but recovered as soon as it was permitted to rise to the superficies of the water. This was one of the many projected chimerical inventions of the ingenious Marquis, which he called "Scantlings," meaning probably chips of genius, and which he laid before members of Parliament, from whom, however, he did not receive any encouragement. The same magazine for 1750 records a plan for the construction of a nocturnal horologe, in which the gradual falling of sand through an aperture in a vessel drew up a weight, along a scale marked with notches for the hours and half-hours, which weight and notches being touched in the dark indicated the time.

In 1752 the old clock at York Cathedral, grown useless by age, and whose very large Gothic case covered the wall between the south door and the chapel for early prayers, and blocked up one of the windows, was removed; and an elegant new clock by John Hindley, of York, was put up in its stead. At the same time there was outside the Cathedral, over the south entrance, a handsome dial, both horary and solar; on each side of which was a wooden statue in armour of the time of Henry VII., which struck the quarters on two small bells. Early in the present century these ancient clock and figures were removed, and the present dial was substituted. The clock of St. Martin's Church, Coney Street, York, is illuminated, and projects into the street, and upon it is the figure of a man taking a solar observation.

In 1753 was published a description of two methods by which the irregularities in the motion of a clock, arising from the influences of heat or cold on the rod of the pendulum, might be prevented, with some papers on the same subject previously read before the Royal Society, by John Ellicott, clockmaker and F.R.S. In the 'Philosophical Transactions' of 1761 are 'Observations for proving the going of Mr. Ellicott's clock at St. Helena,' by Charles Mason. In the same work for 1762 appear further observations 'concerning the going of Mr. Ellicott's clock at St. Helena,' by James Short, F.R.S. In the same work and year were published 'Observations on a Clock of Mr. John Shelton, made at St. Helena,' by Nevil Maskelyne, D.D., F.R.S., an astronomer and mathematician. About this time were carried on smart contests on the subject of the improvements made in the pendulum, and several claims to new inventions therein were set up by rival mechanics. In

1772 was published the mezzotinto three-quarter length portrait, engraved by Dunkarton, after Dance, of John Ellicott, who died in that year, aged sixty-seven. He is represented sitting. At Greenwich Observatory was an astronomical clock made by Shelton, before named.

The Horse Guards clock was originally made by Thwaites, of Clerkenwell, in 1756. It is a large thirty-hour clock, striking the quarters upon two bells, and showing the time upon two white dials with black figures, seven feet five inches in diameter, one facing St. James's Park, and the other Whitehall. The frame is of wrought iron, the wheels are of the best yellow brass, and the escape and centre-wheel, arbors, and pinions are of case-hardened and tempered steel. The going part discharges the hours as well as the quarters. Originally the clock had a common recoil escapement, and the pallets became much worn. The pendulum was eight feet two inches long, and to reduce the arc of vibration it was furnished with fans. In 1816 the going part, including the dial, works, and hands, and the connecting rod-work, was made new by B. L. Vulliamy, the Queen's clockmaker. The new going train consists of only three wheels, namely, an escape, which makes one revolution in four minutes; a centre-wheel, one revolution in an hour; and a great wheel and two pinions, each of twenty-two teeth. The brass barrels and caps are new, and a ratchet attached to the great wheel keeps the clock going while being wound. The pivots work in gun-metal holes, in bosses, which are held by screws, not riveted. The front pivot of the escape wheel carries a seconds' hand, which, as the pendulum vibrates two seconds, shows the seconds by the hand advancing two seconds each vibration. The pendulum has a teak-wood rod, and a cast-iron bob, weighing one hundred and

ninety pounds. It is terminated by a gun-metal screw and nut, cut into a strong thread, by which the clock is regulated. The pendulum is so hung as to be independent of the frame of the clock, which can be taken to pieces and cleaned without disturbing it. The escapement is the pin-wheel. In this clock, says Vulliamy, are applied, it is believed for the first time, the following improvements:—a dead pin, wheel escapement, a two seconds' pendulum, a ratchet, to keep the clock going while being wound, and a degree plate, to indicate very correctly the arc of the vibration of the pendulum.

And here we may mention that the accuracy of a clock depends chiefly on its escapement, or that part of the mechanism which connects the regulating power with the wheelwork. Babbage, in his 'Economy of Manufactures,' 1835, tells us that "clocks and watches may be considered as instruments for registering the number of vibrations performed by a pendulum or a balance. The mechanism by which these numbers are counted is technically called a scapement. It is not easy to describe; but the various contrivances which have been adopted for this purpose are amongst the most interesting and ingenious to which mechanical science has given birth. Working models on an enlarged scale are almost necessary to make their action understood by the unlearned reader; and unfortunately these are not often to be met with. A very fine collection of such models exists amongst the instruments at the University of Prague."

The 'Annual Register' for 1760 tells us, that at a quarterly meeting of the governors of Dublin workhouse, held on October 6th, 1760, under the presidency of the Earl of Lanesborough, it was resolved unani-

mously, "That the thanks of this board be presented to the Right Hon. Lady Arabella Denny, for the continuance of her kind and most useful attention to the foundling children, particularly for a clock lately put up in the nursery, at her Ladyship's expense, with the following inscription, *viz.* 'For the benefit of infants protected by this hospital, Lady Arabella Denny presents this clock, to mark, that as children reared by the spoon must have but a small quantity of food at a time, it must be offered frequently; for which purpose, this clock strikes every 20 minutes, at which notice all the infants that are not asleep must be discreetly fed.'"

Repeating clocks and watches are instruments for registering time, which communicate their information audibly only upon the pulling of a string, or by some similar application. Several instruments have been contrived for awakening the attention of the observer at times previously fixed upon. The various kinds of alarums connected with clocks and watches are of this kind. In some instances it is desirable to be able to set them so as to give notice at many successive and distant periods of time, such as those of the arrival of certain stars on the meridian. A clock of this kind was used at the Greenwich Observatory a long time ago. Ferdinand Berthoud, a French marine clockmaker, who was born at Plancemont, in Neufchâtel in 1727, and died in 1807, invented an astronomical clock, which by means of a cord was made to strike the seconds during the progress of an observation; the number of beats being counted gave the time of duration. Berthoud wrote several works on horology in his own language, some of which were reprinted. The first appeared in 1760.

The subjoined description of a curious vocal clock is

given in the journal of the Rev. J. Wesley:—"On Monday, April 27, 1762, being at Lurgan, in Ireland, I embraced the opportunity which I had long desired, of talking to Mr. Miller, the contriver of that statue which was in Lurgan when I was there before. It was the figure of an old man standing in a case, with a curtain drawn before him, over against a clock, which stood on the opposite side of the room. Every time the clock struck, he opened the door with one hand, drew back the curtain with the other, turned his head as if looking round on the company, and then said, with a clear, loud, articulate voice, past one, or two, or three, and so on. But so many came to see this (the like of which all allowed was not to be seen in Europe), that Mr. Miller was in danger of being ruined, not having time to attend to his own business. So as none offered to purchase it or reward him for his pains, he took the whole machine to pieces."

About the middle of the eighteenth century, Colonel Magniac, a famous clockmaker, lived in an old mansion in St. John's Square, Clerkenwell, and had his workshops there. This manufacturer's automaton clocks caused much interest at the Court of China and elsewhere, and perhaps did much to render Clerkenwell noted as the clockmaking parish. Two of the most remarkable clocks manufactured by him for the emperor were rare specimens of mechanical skill; in addition to regiments of soldiers, musical performers parading, beasts and birds, all displaying appropriate action, combined to show what varied and graceful motions could be produced by wheels, pinions, and levers, and while pleasing the eye also charmed the ear by the bell music, tunes, and chimes. Early in the present century the above-mentioned mansion was pulled down, and Messrs.

J. Smith and Sons purchased the freehold and built their extensive clock manufactory upon it. The workshops and warehouses of this establishment are the largest of any used for clockmaking in Clerkenwell.

The 'Annual Register' for 1764 informs us that some time before that year the Royal Academy of Paris was presented with a repeating clock, which struck the hours and quarters with only a single striking wheel, the inventor rejecting two-thirds of the pieces contained in the striking part of the ordinary repetition clock.

In the last century, Henry Bridges, an architect, of Waltham Abbey, constructed an elaborate mechanism called the Microcosm, or Little World; which, after his death, came into the possession of one Edward Davis, who, some time between 1764 and 1789, publicly exhibited it, and published a pamphlet describing it, containing an engraving of the machine. It was built in the form of a Roman temple, being ten feet high, and six feet broad at the base; and consisted of five principal parts. It contained a variety of moving, life-like figures of men, women, and animals. At the top were three scenes, which changed alternately. The first represented the Muses on Parnassus; the second, a forest with Orpheus and wild beasts; the third, a sylvan grove with birds flying and singing.

In the centre of the structure stood a clock, which was divided into two astronomical systems, the uppermost being the Ptolemaic, and the lower the Copernican. In the former, the earth represented the centre of motion, with an hour circle round it, and the sun and moon revolved every twenty-four hours. It showed the rising, southing, and setting of the sun, which always pointed out the hour of the day, and rose and set at the same time as it really did. There were two

blue circular plates, called horizons, one on the left hand, and the other on the right, which rose and fell according to the lengthening or shortening of the days, in order to regulate the sun's rising and setting; so that as the sun went round in twenty-four hours, being within the hour circle, it passed by every hour on the plate, and pointed out the time of the day. In order to tell the time in the night after the sun was set, there was an hour-hand placed directly opposite to the sun, also a minute and second hand, all on one centre, so that the time of the day or night might be as easily known by this as by any other clock. There were two other hands on this centre, one called the moon's nodes, which showed the time of the eclipses; and the other the equation of time, or the difference between the sun and the clocks. There were also two lesser horizons within those of the sun, to regulate the rising and setting of the moon, in the same manner as those of the sun. The moon showed the time of new and full, her increase and decrease, always representing the same figure as it really was in the heavens.

The Copernican system was composed of seventeen bodies, in the centre of which was placed the sun, showing its rotation, and the planets moving round it, in the same signs of the zodiac as they were in reality. Their orbits had all due inclinations, and lay in their true plains. Underneath were folding doors, which on being opened discovered four other systems, in which the motions of the planets were more clearly described. The first was the solar system; the second, the system of Jupiter and his moons; the third, the eclipses of the sun and moon; and the fourth, the earth's annual motion. Another piece of mechanism represented the course of the comet of 1759.

Below these was the representation of a landscape and the sea. On the former vehicles, persons, and animals were seen in motion; and on the latter ships were sailing. Another scene displayed a carpenter's yard with men at work. During the whole performance of the machine, when upwards of one thousand two hundred wheels and pinions moved all together, it played several pieces of music on an organ, which likewise was provided with keys, so that any piece might be played upon it.

Again we introduce a passage from the poetry of horology. Young, who was born in 1684, and died in 1765, wrote these suggestive lines:—

> "From old Eternity's mysterious orb
> Was Time cut off and cast beneath the skies—
> The skies which watch him in his new abode,
> Measuring his motion by revolving spheres,
> That horologe machinery divine."

CHAPTER V.

Alexander Cumming — Wind Clock — Barometer Clocks — Diminutive Clock presented by East India Company to Emperor of China — Clockmakers' Epitaphs — Kay, a Clockmaker, helps to make a Spinning Machine — Devereux Bowly — James Cox, the Watchmaker — His Museum — Curious Automaton Clocks therein — The Chronoscope — Perpetual Motion Clock — Jewelled Clock for the Grand Signor — Emanuel Swedenborg's Death — Paris Clocks — Pendulums — John Bryant — Blind Clockmaker — Maidstone Clock — Cuckoo Clocks and South Sea Islanders — Clockwork for Naval Warfare — Clock at Zaragoza — The Horologe of the Fields — Clock at Palma — Clock Custom at Hatherleigh — Novel Clock — Berne Clock — Coblentz Clock — Clock to light a Candle — Human or Living Clock — Tyburn Gate Clock — Norwood Clock — Windsor Castle Clock — Story of a Clock and a Sermon — Illuminated Clock Dials — Paper Clocks — Gun Clock — Cannon Clock — Clock to set a Watch — Clock to beat time for Music — Duke of York's Clock — Detonating Wooden Clock — Arithmetical Clock — Man's Mind like a Clock — Clocks at Petersburgh — Egg Clock — Electrical Clocks — How to Lengthen Life — Royal Exchange Clock — Burning of the Old Exchange — General Post Office Clock — Cremille Victualling Office Clock — Regulator Clock — Vulliamy.

Alexander Cumming, F.R.S., an ingenious mathematician and mechanic, a native of Edinburgh who died in 1814, made a clock for George III., which registered the height of the barometer during every day throughout the year. This was effected by a circular card, of about two feet in diameter, being made to turn once in a year. The card was divided by radii lines into three hundred and sixty-five divisions, the months and days being marked round the edge, while the usual range of the barometer was indicated in inches and tenths by circular lines described from the centre. A pencil, with a fine point pressed on the card by a spring

and held by an upright rod floating on the mercury, accurately marked the state of the barometer; the card, being carried forward by the clock, brought each day to the pencil. It was not even necessary to change the card at the year's end, as a pencil with a different coloured lead would make a distinction between two years. This barometer clock cost nearly 2,000*l.*, and the maker was allowed a salary of 200*l.* per annum to keep it in repair. Cumming in 1766 published 'The Elements of Clock and Watch work, adapted to practice.' The following is a copy of the original advertisement of this work:—"This day is published, in one volume in quarto, price 15*s.* in boards, 'The Elements of Clock and Watch work, adapted to practice;' in two essays. By Alexander Cumming, Member of the Philo. Soc. Edinburgh. Printed for T. Cadell (successor to Mr. Millar) and D. Wilson and G. Nicol, in the Strand; and Fletcher and Anderson in St. Paul's Churchyard."

Sir Christopher Wren proposed to have a clock constructed on a similar principle to that of Cumming's barometer clock, in order to register the position and force of the wind. This idea has been of late years adopted. At Greenwich Observatory is a contrivance for registering the force and direction of the wind. It was thus described in 'Household Words' for 1850:—"The wind turns a weather-cock, and by aid of cog-wheels the motion is transferred to a lead pencil fixed over a sheet of paper, and thus the wind is made to write down the direction which itself is blowing. Not far distant is a piece of metal, the flat side of which is ever turned by the weathercock to meet the full force of the wind, which, blowing upon it, drives it back against a spring. To this spring is affixed a chain passing over pulleys towards another pencil, fixed above a

sheet of paper, and moving faithfully, more or less, as the wind blows harder or softer. And thus the 'gentle zephyr' and the fresh breeze, and the heavy gale, and, when it comes, the furious hurricane, are made to note down their character and force. The sheets of paper on which the uncertain element, the wind, is bearing witness against itself, is fixed upon a frame moved by clockwork. Steady as the progress of time, this ingenious mechanism draws the paper under the suspended pencils. Thus each minute and each hour has its written record, without human help or inspection. Once a day only, an assistant comes to put a new blank sheet in the place of that which has been covered by the moving pencils, and the latter is taken away to be bound up in a volume. The book might with truth be lettered 'The History of the Wind; written by Itself,'—an Æolian autobiography."

Babbage, in his 'Economy of Manufactures,' 1835, says:—"Another purpose to which machinery for registering operations is applied with much advantage is the determination of the average effect of natural or artificial agents. The mean height of the barometer, for example, is ascertained by noting its height at a certain number of intervals during the twenty-four hours. The more these intervals are contracted, the more correctly will the mean be ascertained; but the true mean ought to be influenced by each momentary change which has occurred. Clocks have been proposed and made with this object, by which a sheet of paper is moved, slowly and uniformly, before a pencil fixed to a float upon the surface of the mercury in the cup of the barometer. Sir David Brewster proposed, several years ago, to suspend a barometer, and swing it as a pendulum. The variations in the atmosphere would thus

alter the centre of oscillation, and the comparison of such an instrument with a good clock would enable us to ascertain the mean altitude of the barometer during any interval of the observer's absence. About seven or eight years since, without being aware of Sir David Brewster's proposal, I adapted a barometer as a pendulum to the works of a common eight-day clock; it remained in my library for several months, but I have mislaid the observations which were made." In 1837 Jorgenson, a celebrated watchmaker, of Copenhagen, invented a clock which at the end of every twenty-four hours indicated the average temperature of the preceding day.

We learn from the 'Gentleman's Magazine,' and the 'Annual Register,' for 1766, that in that year two curious clocks of small size and of great beauty were presented by the East India Company to the Emperor of China. These clocks were in the form of chariots. In each of these chariots was the figure of a lady seated, with her right hand leaning on part of the vehicle, underneath which was a striking eight-day clock, not larger than a shilling. Upon the lady's finger sat a bird, set with diamonds and rubies, with its wings expanded, which were made to flutter for some time by touching a diamond button below it. The body of the bird, that contained the mechanism by which this was effected, was not larger than the sixteenth of an inch. The lady held in her left hand a gold tube of the thickness of a large pin, on the top of which was a small round box, to which a circular ornament set with diamonds, not larger than a sixpence, was fixed. Over the lady's head, supported by a small fluted pillar, no bigger than a quill, was a double umbrella, under the largest of which a bell was fixed

at a considerable distance from the clock, but having a hidden communication with it, by which a hammer was made regularly to strike the hour, and to repeat the same at pleasure by touching a diamond button underneath the clock. At the feet of the lady was a gold dog, before which from the point of the chariot were two birds, fixed on spiral springs, their wings and feathers being set with coloured stones; and they appeared as if they were flying from the vehicle. By a secret motion the chariot could be moved in any direction; a boy behind it appearing to push it forward. This exquisite piece of art and workmanship was made entirely of gold, superbly embellished with diamonds, rubies, pearls, and other precious stones.

Among the several quaint epitaphs upon clock and watch makers which we shall introduce to our readers is the following, that appears in the churchyard at Axbridge, Somerset, on an upright gravestone:—

"Bilbie thy
Movements kept in play
For thirty years or more,
We say.
"Thy Balance or thy
Main spring's broken,
And all thy movements
Cease to work.

"John Bilbie, of this parish, clockmaker, who died Sept. 13th, 1767, aged 33 years."

At Hoddam, Dumfriesshire, is the following epitaph:—

"Here lyes a man, who all his mortal life
Past mending clocks, but could not mend hys wyfe.
The 'larum of his bell was ne'er sae shrill
As was her tongue, aye clacking like a mill.
But now he 's gane—oh, whither? nane can tell—
I hope beyond the sound o' Mally's bell."

In 1767 a person named Highs or Hays, a reedmaker at Leigh, took up the plan of attempting to spin by rollers. He made experiments for this purpose, and employed Kay, a clockmaker, to assist him. It does not appear that they achieved any success. Richard Arkwright was at this time a barber and peruke-maker in Bolton. In his accustomed journeys on his business he formed the acquaintance of Kay, then removed to Warrington, and from him learned the attempts which were then being made by Highs. Arkwright adopted the inventions and improvements, and appropriated them to his own use. He afterwards erected works at Crumford, in Derbyshire, and acquired a fortune of nearly half-a-million sterling. His system of machinery, to which he gave the name of a "Spinning Jenny," has given employment to countless thousands of people, and been productive of vast commercial advantage to this country. How much of that success was due to the mechanical genius of the clockmaker we are left to guess; but we may fairly assume that the reedmaker and the barber knew less of the details of machinery than he did.

An old and excellent hall-clock in the city of Philadelphia bears the name of Devereux Bowly, of Lombard Street, London, as the maker. He died March 15th, 1773, in the seventy-eighth year of his age. He was a member of the Society of Friends, and being at the time of his decease a widower and without a family, he left a large portion of his property to their school, then at Clerkenwell, in the neighbourhood of which he resided.

James Cox, of No. 103, Shoe Lane, Holborn, was an eminent watchmaker, jeweller, and mechanician of the last century. When there was a prospect of the interior

of India being opened to British enterprise, he made a number of curious splendid and costly toys of the richest materials, hoping to sell them profitably to the Indian princes. His design was, however, frustrated by the breaking out of war, and his articles being quite unsaleable in the European markets, he endeavoured to turn them to account by exhibiting them in a museum in Spring Gardens in 1773 and 1774.

These artistic figures were described in the catalogue as "exquisite and magnificent pieces of mechanism and jewellery." The insecurity of property at the period compelled Cox to take the strictest precautions to guard his treasures; only a few persons were admitted at a time, twice in the day, and the charge for admission was half-a-guinea. His expedient proving very unremunerative, he in 1773 obtained a private Act of Parliament empowering him to dispose of his museum by lottery; this act received the royal assent by commission on June 21st, in that year; and on May 1st, 1775, the drawing commenced at Guildhall. Cox was not merely an ingenious mechanic; he was probably the first of his trade in England who studied artistic effect; and he employed Nollekens, the sculptor, and Zoffany, the painter, to make designs for his works. The preamble to his Act of Parliament states that "the painter, the goldsmith, the jeweller, the lapidary, the sculptor, the watchmaker, in short all the liberal arts have found employment in and worthily co-operated" in his museum. The fifty-six "pieces" composing it were valued at 197,500*l.*, and were all of a most rich and rare character. Among the many beautiful specimens of clocks and clockwork enumerated in the descriptive catalogue was "piece the forty-second, a cage of singing-birds."

"It is placed upon a most superb commode of gold and lapis lazuli, set in frames of silver and pannels of gold; ornamented with the greatest taste and elegance, with trophies and finely adapted designs; the cage is supported at the four angles by rhinoceroses, and in the front by an elephant. The commode contains a fine set of bells, that rings changes and plays many curious tunes. The doors in front, when opened, discover a grand cascade of artificial water falling from rocks: besides this, fresh streams are poured down from dolphins, and blown up by Tritons out of their shells; while a number of mirrors, placed in the cavities of the rock, reflect the whole, and render the effect most pleasingly astonishing. Upon a superb pedestal stands a cage of incomparable richness and beauty, composed of gold, silver, jewellery, and agate; it is designed from an elegant architectural plan wrought in silver and gold, with an execution truly masterly: under the doors of the cage several birds are seen in motion; on the right appear a nest of birds fed by the old one; on the left, birds are seen picking fruit and flowers. Upon the cage is an eight-day musical clock, that chimes, strikes, and repeats, has two dials, and at the right and left of the cage gives motion to vertical stars in jewellery. Above the clock is a temple of agate, adorned with pillars of silver and ornaments of gold and jewellery: in front there is the representation of a house, with a mill, bridge, people, and other pleasing objects in motion. Above the temple is a hexagonal pavilion, in the centre of which is a double vertical star, terminating with a large star, in spiral motion, that seems to extend its points. Within the cage are a bullfinch and a goldfinch, all of jeweller's work; their plumage formed of stones of various colours; they

flutter their wings, they warble, and move their bills to every note of the different tunes they sing, which are both duets and solos, surprisingly melodious, to the universal astonishment of the auditors."

Another article in Cox's museum was a large eight-day clock, which was described in the inventory as follows:—"It stands upon four superbly chased and gilt feet, bordered also in several parts with wrought frames, moulding, and other embellishments. At the angles of the case are richly chased therms, with ornaments of flowers dropping loosely down. Upon the corners are gilt vases, and upon the centre of the top is an octagon temple, standing on a quadrangular ground, at the corners of which are four gilt pine apples. The dome of the temple is blue and gold, terminating with a gilt vase; within the temple is a moving procession of the various characters in Shakespeare's 'Jubilee.' This elegant case contains a very excellent musical clock, playing eight tunes; the enamelled dials fixed within a finely wrought, highly embossed, and richly gilt frame, supported by lions couchant. Above the dial are a wind and water mill, a horse grazing, and a mason working, By the side of the windmill is a cart, which is both loaded and unloaded alternately, and is always moved by the movement of the clock; the miller, moreover, is seen descending from the mill, and the sacks are conveyed to and placed regularly in the cart till full, when it is again emptied, and this succession of changes is continued perpetually. The water-mill is equally curious and pleasing; the river is seen to flow, the water-mill to work, and the water run down under the wheel; the door of the mill also flies opens, and discovers the miller standing within by the side of the hopper, in which the flour descends, and after so

continuing for some time the door closes again, and the motion ceases."

In this inventory of clockwork rarities is a description of the Chronoscope, the fellow to which was presented to the Emperor of China in 1769. This timepiece, which was richly embellished by many costly ornaments, contained a curious clock, with dials on each side. They were made of crystal, so as to show the motions of the clock; each dial was divided into three parts, containing a minute, a second, and an hour hand, and a fourth dividing the minute into two hundred and forty degrees. Besides a great weight of gold, there were nearly one hundred thousand precious stones, including diamonds, rubies, emeralds, and pearls, used in the embellishment of this Chronoscope.

In the museum of Cox was also the Perpetual Motion, "a mechanical and philosophical timepiece." "From this piece," says its inventor, "by a union of mechanic and philosophic principles, a motion is obtained, which will continue for ever; and although the metals of steel and brass of which it is constructed must in time decay, still the primary cause of its motion being constant, and the friction upon every part extremely insignificant, it will continue its action for a longer duration than any mechanical performance has yet been made to do." This perpetual timekeeper differed but little from an ordinary clock, except that it was with diamonds jewelled in every part where the friction could be diminished. We have now before us an old engraving by J. Lodge, representing 'Mr. Cox's Perpetual Motion, a Prize in the Museum Lottery.' It is somewhat like a tall eight-day clock, with the ordinary dial at the top; the sides and front of the case appear to be of glass, through which are seen some cumbersome pendulum work, and

cords and pulleys. We might extract several other interesting descriptions of clockwork automata which were to be found in this unique collection: but if we were to do so we should be digressing from our subject, the curiosities of horology. It was said in praise of the possessor of this museum of mechanical wonders, by Mason, a contemporary poet:—

> "Great Cox, at his mechanicall,
> Bids orient pearls from golden dragons fall;
> Each little dragonet, with brazen grin,
> Gapes for the precious prize, and gulps it in.
> Yet, when we peep behind the scene,
> One master wheel directs the whole machine:
> The selfsame pearls, in nice gradation, all
> Around one common centre rise and fall."

In the 'Gentleman's Magazine' for 1771, and the 'Annual Register' for the same year, we read that an eminent jeweller of London had a clock of exquisite workmanship, which was designed for the Grand Signor. The case was of massy gold, finely embossed, overlaid with diamonds, some of them being as large as, or larger than, a guinea, and of the finest lustre. Pearls as big as birds' eggs hung on two gold enamelled trees, that grew out of the gold rock pedestal on which the clock stood. A tree was on each side, and its fruit were pearls, and its leaves were emeralds. Two great emeralds as large as pears were fixed on the two front pillars, and the characters on the dial plate, which were Turkish, and the hands also were of diamonds. This bejewelled horologe was in keeping with eastern splendour, and might have struck the hours in an Arabian night's entertainment very fittingly.

On March 29th, 1772, Emanuel Swedenborg died. As he lay upon his death-bed he heard a clock strike.

He asked his landlady and her maid, who were both sitting at his bedside, what o'clock it was; and upon being answered, he said, "It is well—I thank you—God bless you," and then in a moment after he gently expired.

The church of St. Vincent de Paul at Paris has two clocks, one for telling the hour of the day, and the other, the days of the month. The Hotel de Ville clock, at this city, of which report speaks highly, was described in 1844 as being a thirty-hour clock, made by Lepante in 1781, and costing, including the two dials, three bells, and fixings, ninety thousand francs (3,000*l.*) In all the large public clocks on the Continent lantern pinions are used, and in the one at the Hotel de Ville they are pivoted into a frame similar to the pinions of Harrison's first chronometer. In this clock, although the curve on the wheel-teeth have no pretensions to mathematical accuracy, having been filed up by hand, there is not, after many years' performance, any appearance of wear either on the face of the teeth, or in the pivot-holes of the leaves. The weight of the first power is three hundred and fifty pounds. B. L. Vulliamy says: "I was the first in this country to employ a two-seconds pendulum (the clock at the Hotel de Ville at Paris is indeed the only clock on the Continent that I ever saw with one), or who applied a hand to indicate seconds, or a degree plate, by which to ascertain the arc of vibration of the pendulum, and, with few exceptions, to employ for a pendulum a wooden rod, a short suspension spring, and a very heavy bob. Previously to this the pendulum rods were almost invariably made of iron, with very long springs and light bobs." To compensate a two-seconds pendulum is always attended with much inconvenience. The pendulum of the great clock at the

Hotel de Ville is a two-seconds one, with a nine-bar gridiron rod; and the great weight of the rod is a serious objection to it. Writing on the subject of clocks in France, Vulliamy condemns their style, or as their makers say, "luxe d'exécution;" and in reference to their pendulums he says: "No expense is spared in the pendulums of French clocks of a superior class, which are all what are termed gridiron pendulums, of various constructions, varying from five to nine bars, and in length from about five to seven or eight feet; consequently the clocks cannot indicate seconds in the ordinary mode; indeed, I did not notice a single clock of this description to which a seconds-hand or index, or a degree-plate to indicate the arc of vibration of the pendulum, was supplied. The execution of these pendulums certainly is very beautiful; but the great weight of the rod in reference to the bob is a very serious error in principle, and, in my opinion, more than counterbalances any advantages they may be thought to possess."

In Turner's 'History of Hertford' will be found an account of John Bryant, the bell-founder and clockmaker, who was born at Exning, in Suffolk. Although designed for holy orders, his love of mechanism was so strong that he was allowed to follow his natural bent. In both branches of his trade he attained to a pre-eminence which rarely has been acquired by an individual. As proofs of his skill in horology may be enumerated the clocks of the Dukes of Marlborough, Rutland, and Grafton; the Marquises of Exeter and Salisbury; the Earls of Hardwicke and Cowper; the Lords Montague and Breadalbane; together with the clock in the Town Hall of Hertford. Bryant died in 1829, aged eighty-one, and is buried at Hertford. His

bells and clocks there bear various dates between the years 1782 and 1824.

William Kennedy, the celebrated blind mechanic, of Banbridge, county Down, Ireland, who died about the year 1790, actually made many clocks, both common and musical.

In the 'Gentleman's Magazine' for 1807, is an engraving, from a drawing by T. Fisher, of a conduit of stone which stood in the middle of High Street, Maidstone, and was pulled down about the year 1793. It formed a kind of octagonal embattled tower, crowned with a clock and cupola.

About 1796 some missionaries took out to Tongataboo, one of the Friendly Islands in the South Sea, among other things, an assortment of cuckoo-clocks, which soon became to the natives objects of universal wonder, the general opinion being that a spirit spoke in them, and would detect the people if they stole anything from the ship or the missionaries. Toogahowe, one of the natives, stood in such awe of them, that he would not have one in his house. Moomooe, his father, however, regarded them differently; and when he found himself dangerously ill, he requested that some of the brethren would come and sing psalms for him, and bring a cuckoo-clock to assist in healing him. The high priest, knowing perhaps the mysteries of his own profession, was exceedingly delighted with these clocks, desired to have one, and as soon as he got it home took it to pieces to examine the inside. To put it together again was beyond his skill, and unluckily it was beyond the skill of the missionaries also. None of them had been instructed in this branch of mechanism, and the discovery of their ignorance excited the contempt of the natives.

About 1797, a man named Fulton invented a clock-work machine to blow ships out of the water in battle; the adoption of which deadly instrument by the Board of Admiralty was sufficiently ridiculed in the opposition papers of the day.

Early in the present century, the tower of the metropolitan church of La Seu, at Zaragoza, was finished from designs made in 1683. The allegorical statues of Time and Vigilance support the dial of a clock in the second story of this tower; but considering how lazily life flows along in Spain, there seems to be a touch of satire in this public hint. The cathedral at Toledo has two old lateral gates, one of which is called the Relox, or the clock-house, and also the Lost Child. The clock itself is placed on a handsome and comparatively modern tower.

The 'Annual Register' for 1807 contains a poem, entitled, 'The Horologe of the Fields,' by Charlotte Smith, addressed to a young lady on seeing at the house of an acquaintance a magnificent French timepiece:—

"For her who owns this splendid toy,
Where use with elegance unites,
Still may its index point to joy,
And moments wing'd with new delights.

"Sweet may resound each silver bell,—
And never quick returning chime,
Seem in reproving notes to tell,
Of hours mispent, and murder'd time.

"Tho' Fortune, Emily, deny
To us these splendid works of art,
The woods, the lawns, the heaths supply
Lessons from nature to the heart.

"In every copse, and shelter'd dell,
Unveil'd to the observant eye,
Are faithful monitors, who tell
How pass the hours and seasons by.

"The green-robed children of the spring
Will mark the periods as they pass,
Mingle with leaves time's feather'd wing,
And bind with flowers his silent glass.
* * * * * *
"Thus in each flower and simple bell,
That in our path untrodden lie,
Are sweet remembrances who tell
How fast the winged moments fly.
"Time will steal on with ceaseless pace,
Yet lose we not the fleeting hours,
Who still their fairy footsteps trace,
As light they dance among the flowers."

The following lines refer to the horologe of the seasons:—

"Round the great dial of the year
The seasons went and struck the quarters;
Whilst the swift months, like circulating hours,
Told the twelve changes by their changing flowers."

A writer in 1809 tells us that in the Mansion House, at Palma, in the Island of Majorca, was a clock called by some the Balearic, and by others the clock of the sun, and well worthy of observation. No one was able to say where it was made, or from whence it was brought. It marked and struck the different hours of the days and nights according to the progress of the sun, and the different solstices; and it was generally allowed to be the only one of its kind in the world.

In the 'Gentleman's Magazine' for 1816, we read that at Hatherleigh, a small town in Devonshire, then existed a custom that every morning and evening soon after the church clock had struck five and nine, a bell from the small steeple announced by distinct strokes the number of the day of the month. This probably was originally intended for the information of the unlearned villagers.

In the same Magazine for 1817, we are told that a clock on an entirely new system had then lately been made by John Thomas, a native of Caerleon, who resided at Newport, Monmouthshire, and was a working smith and farrier. This piece of mechanism continued going, after once winding up, for the space of three hundred and eighty-four days. It had a pendant, vibrating seconds, and a dial-plate, showing minutes and seconds. The plates and wheels were of brass, and the pinions of the best cast-steel. It was in action at the maker's house.

The 'Mirror' for 1823 tells us that at the clock-gate of Berne, about half-way between the pavement and the pinnacle, is a large party of wooden bears dressed like soldiers of the olden time, in coat, armour, and gabardines; some bearing a halberd and others a matchlock, and accompanied by several other bears, who act in the capacity of trumpeters and kettle-drummers. Directly the clock begins to strike the hour this company marches out of a little tower attached to the dial-square, and after nodding their heads to the people, walk to their original quarters. Above them sits an old pantaloon, with spectacles across his nose, acting as dummy on the occasion; and not far from him is a clown, who, seated like an Indian juggler, obeys the summons of the hour by striking in return two bells, right and left, shaking his head meanwhile very whimsically. At the extreme top of the clock-tower under a kind of belfry stands a large figure in armour to strike the hour on a great bell. This exalted personage is frequently mistaken for a plumber mending the clockworks. Besides all this, immediately above the arch of the gate is stationed a cock of gay and golden plumage, as large as life, who claps his wings and

crows almost as genuinely as the real bird; an effect which is produced by mechanism acting on some organ stops. The redoubtable name of this clock tower is Zeitglochenthurm.

Longfellow, in his 'Hyperion,' tells us "that on the belfry of the Kaufhaus in Coblentz is a huge head with a brazen helmet and a beard; and whenever the clock strikes, at each stroke of the hammer this giant's head opens its great jaws and smites its teeth together, as if, like the brazen head of Friar Bacon, it would say, 'Time was; Time is; Time is past.' This figure is known through all the country round about as 'The Man in the Custom House;' and when a friend in the country meets a friend from Coblentz, instead of saying, 'How are all the good people in Coblentz?' he says, 'How is the Man in the Custom House?' Thus the giant has a great part to play in the town."

In 1823 was invented by T. W. George, of St. George's-in-the-East, an apparatus, which by the sole agency of a clock, lit a candle at any desired time. It was constructed in the following manner:—A pistol-lock was let into a piece of wood, which was primed with a few grains of pulverized gunpowder; a match was next suspended over the priming, in a slope with the candle's snuff; it was then cocked, and a rod of a peculiar construction attached to the trigger was drawn out a certain distance, and secured by a tooth. The apparatus was then ready. The alarum at the desired hour ran off, and woke the workman up to an early-rising business, and the alarum-weight in descending came upon the trigger-rod, which it let loose, and effected the desired end instantaneously.

The 'Bibliothèque Universelle' (*vide* also the 'Gentleman's Magazine' for 1825) records particulars of a man

named J. D. Chevalley, a native of Switzerland, who had in 1825, at the age of sixty-six, arrived at an astonishing degree of perfection in reckoning time by an internal movement. He was in fact a human time-piece or living clock. In his youth he was accustomed to pay great attention to the ringing of bells and the vibrations of pendulums; and by degrees he acquired the power of counting a succession of intervals exactly equal to those which the vibrations or sounds produced. Being on board a steamboat on the Lake of Geneva, on July 14th, 1823, he engaged to indicate to the crowd about him the lapse of a quarter-of-an-hour, or as many minutes and seconds as any one chose to name, and this during a most diversified conversation with those standing by; and further, to indicate by his voice the moment when the hand passed over the quarter, minutes, or half-minutes, or any other subdivision previously stipulated, during the whole course of the experiment. This he did without mistake, notwithstanding the exertions of those about him to distract his attention, and clapped his hand at the conclusion of the fixed time. His own account of his gift was as follows:—"I have acquired by imitation, labour, and patience, a movement, which neither thoughts nor labour nor anything can stop. It is similar to that of a pendulum, which at each motion of going and returning gives me the space of three seconds, so that twenty of them make a minute, and these I add to others continually."

The arch and doors forming the centre portion of Tyburn gate, which was removed about 1825, with the old clock, are still standing at the entrance to a wooden cowshed, on the premises of Mr. Baker, a farmer at Cricklewood, who bought them at the time when the gate was taken down.

In 1825 B. L. Vulliamy visited Paris to see the public clocks in that city, and the first clock he made upon his return was that for the church at Norwood, Surrey, in the year 1827. In this clock he adopted an entirely new mode of construction, which has since been followed with great success. By direction of the Board of Ordnance it was surveyed by the late Sir John Jones, Commanding Royal Engineer at Woolwich, whose report on the subject, under date August 14th, 1828, states, *inter alia*:—

"I have been to Norwood, and have minutely inspected in detail the works, &c., made and fixed up in the church in that place by Mr. Vulliamy. I beg leave to report that it appears to me superior to any turret-clock I have seen, in the following points:—

"1st. In simplicity of construction, there being fewer wheels and pinions, both in the going and striking parts, than in an ordinary clock; and those two movements being perfectly distinct and only acting together through the medium of the discharging piece, any accident to the one may be repaired without deranging the other. Indeed, this latter advantage may be said to extend through every detail of the machinery; for the holes of the pivots in which the wheels work being fixed by screws, the simple removal of the bosses enables a single wheel or piece to be taken out and repaired or cleaned, without taking to pieces the remainder of the works. This construction also gives greater facility for keeping the machinery oiled.

"2nd. In durability.—The wheels and pinions are made of hard gun-metal and steel, which latter, besides being of long duration, have the advantage over the usual iron case-hardened pinions, wearing equally, and not into angular points, which is found to destroy the

wheels most rapidly. This substitution of hard gun-metal and steel for yellow brass and case-hardened iron, appeared to be general throughout the acting parts of the machine, giving more strength to each.

"3rd. In regularity of keeping time.—The escapement is a dead-escapement, which has the least possible loss of power from drop; and is so well contrived that it instantly caught my attention. In this clock it maintains in motion a pendulum weighing 150 lbs.; which, being far heavier than the pendulum of an ordinary clock of the same size, cannot fail to make it go accurately.

"The barrel cylinders, round which the lines of the weights are coiled, are of iron. The workmanship of every part is of excellent quality, and very far superior to that of the clocks at Woolwich.

"Conclusion.—From the above it seems almost certain that a clock of this construction, besides showing the time more accurately, must last much longer, and be more rarely out of repair than an ordinary clock; and further, from its simplicity it may be looked after and kept in order by a very ordinary mechanic."

As this was the first clock made upon this construction, we will let the maker, Vulliamy, describe in his own words the difference between it and the old method. He writes:—"In a turret-clock made upon the common or old construction, the wheels, and in fact all parts of the work, as well relating to the going as to the striking part or parts, are mounted in one frame. This frame is composed of various pieces in the form of flat bars and round pillars, which are connected together by screws and nuts, and generally so arranged that the pivots of each train of wheels act in two opposite bars; consequently, when either of these bars is for

any purpose removed, the entire train of wheels becomes loose and disengaged; so that when the clock is large and the parts heavy, it requires the help of two or three assistants to prevent them from falling, which renders the operation of taking the clock to pieces attended with much trouble, to say nothing of the risk of bending or breaking the pivots or of damaging the wheels. To avoid such accidents, the pivots are generally made larger than would otherwise be necessary, and this greatly increases the friction. Now, however well this framework may be executed (and if made of sufficient strength and well executed, it becomes very expensive), still it is far from possessing the requisite solidity for a machine to measure time, on account of its being so much affected by the vibratory motion caused by the striking part or parts. In the new construction, the going or striking part or parts are perfectly detached from each other; and the wheelwork, &c., of each part is supported by a separate, solid, and entire bed of cast-iron, instead of a frame composed of pieces as formerly. The arrangement of the several parts is such that any one piece can, if required, be removed and restored to its place without disturbing another, and the whole of the clock is perfectly solid and without shake or motion. The jar, and consequent tremulous action, resulting from the fall of the hammer-tail or tails, according as the clock strikes hours only, or hours and quarters, which in the common turret-clock is communicated to the whole machine, is, from the construction of this clock, entirely confined to the striking parts. The construction of the work for communicating the motion from the clock to the hand is entirely different from that usually employed in turret-clocks. It is securely attached to

the cast-iron bed of the going part, is particularly simple, little liable to be out of order, and the connection between the clock and the dial works that carry the hands is made by a straight iron rod, leading direct from the clock to each dial work. The bad arrangement of this part of the work is a very common cause of failure in the generality of large clocks. The construction of a turret-clock which I have adopted offers peculiar facilities for cleaning and oiling the works, which the common construction does not possess, and it can in consequence be kept clean and in order with less trouble, and at much less expense, than a clock made in the ordinary mode."

The clock at Windsor Castle, which was made after the one at Norwood, goes eight days, and strikes the quarters as well as the hours. It is very large, the great wheels of the striking parts being twenty-four inches in diameter; and the hour is struck upon a bell of thirty-two hundredweight. The maker, B. L. Vulliamy, speaks of the clock and its situation thus:—"The clock-room at Windsor Castle is the easiest of access, the best lighted and ventilated, and in all respects the best adapted to the purpose for which it is intended of any that I am acquainted with; but from local circumstances which the skill of the architect, Sir Jeffrey Wyattville, could not overcome, the construction of this clock was attended with much difficulty. The fall for the weights is exceedingly small, and the dial (for the time is shown only on one face) is placed considerably below the clock; the pendulum also is unavoidably very short; and the bells are placed at a considerable distance behind the clock; all which circumstances are more or less prejudicial to its performance. Nevertheless, the accuracy with which

this clock has measured time has been everything that could be desired." It met with the approbation of the late Duke of Wellington, and of other celebrated personages also.

The following good story is told of the learned Dr. Samuel Parr, who was born in 1747, and died in 1825:—The Doctor had preached the Spital sermon at Christ Church on the invitation of the Lord Mayor of London (Harvey Combe); and as they were coming out of church together, "Well," says Parr, "how did you like the sermon?" "Why, Doctor," replies his Lordship, "there were four things in it that I did not like to hear." "State them." "Why, to speak frankly then, they were the quarters of the church-clock, which struck four times before you had finished." The 'New Monthly Magazine' for November, 1826, tells this story; but a similar one is told of Lord Mulgrave and his young chaplain, who had preached a sermon of great length. "Sir," said Lord Mulgrave, bowing to him, "there were some things in your sermon of to-day I never heard before." "Oh, my Lord," said the flattered chaplain, "it is a common text, and I could not have hoped to have said anything new on the subject." "I heard the clock strike twice," said Lord Mulgrave.

The rendering of public clocks visible at night by means of illuminated dials is one of the many improvements introduced of late years. Such dials were, on April 23rd, 1827, first permanently exhibited in London at the church of St. Giles-in-the-Fields, being the invention of Paine, for which he received a silver medal from the Society of Arts on June 4th in that year. We read in the 'Gentleman's Magazine' for 1826, under date December 2nd:—"An illuminated clock, that is, a clock with a transparent dial, has been long wanted

in this great metropolis. In Liverpool, Manchester, and other provincial towns illuminated clocks have been introduced, and their value is fully appreciated; yet London has not been able to boast of this accommodation, though it has been long contemplated at St. Paul's. The churchwardens of St. Bride's, and the church improvement committee have determined on setting the example. The experiment was tried last night by placing a glass dial in the centre intended for the clock, behind which a powerful gas-conductor was fixed, and the rays of light being reflected on the face of the clock, made the points of time as distinctly visible as they are at St. Paul's at noon-day. The appearance when viewed from Fleet Street through the newly-opened vista was at once novel and agreeable, and attracted a great crowd of persons. There can be no doubt but the example will be followed very generally." In the same Magazine for 1827, we read: "Transparent clock-dials intended to show the hour at any time of the night have been recently exhibited at St. Giles's Church, St. Bride's, and other places. The characters are bold and correctly formed in cast-iron, and filled-in with stained glass, behind which lights are introduced, so that the hands as they traverse in the front are distinctly seen, and the time may be ascertained to the greatest nicety, both night and day; and such is the mechanical ingenuity displayed on this occasion, that the clocks by their own revolution light themselves as soon as the sun sets at night, and extinguish the same when the sun rises in the morning, and this throughout the year whether the days are long or short." We believe that the third London clock which had an illuminated dial was that at Whitechapel; and the fourth, Islington.

At the Horse Guards is a clock on which for accuracy of time Londoners place much reliance. A light is thrown on the dial-face by a gas-flame hidden behind a parapet. The usual method of illuminating is to make the dial wholly or partly of semi-opaque glass, and to place a ring of gas-jets behind the dial. In the Westminster clock it was intended that the clock itself should turn the gas on and off, according to the length of the night at different seasons. It was suggested some years ago that semi-opaque hands and figures should be used on a transparent dial, with gas-lights in a black cloth lined chamber behind the dials, and reflectors to throw the light on all except the black cloth. General Perronet Thompson suggested a night-clock, with twelve holes cut in the disc for the twelve hours; and a radial slit near the centre to represent a hand; the disc was to revolve, and gaslights were to be placed behind it. In a fine new turret-clock set up in the Exchange at Leicester in 1859, the lighting at night is effected by placing two large lenses before the gas-burners, connected by a pierced tube of gas-jet, so as to light one burner from the other if either should go out during the day-time, when the gas is turned very low. The light is evenly diffused over the dial, without glare. At Havre is an illuminated clock, the face of the dial being dark, and the figures and hands of a clear golden light.

The French made clocks of paper early in the present century. They were very light, simple in their movements, and possessed many other advantages. The 'Literary Gazette' of June 3rd, 1826, says:—"A friend of ours who has seen them informs us they are really very clever, go well for thirty hours without winding up, and cost only fifty francs."

In the armoury of George IV. was a curious model of a small gun, with a clock attached to the lock, in such a manner that the trigger could be discharged at any time desired by setting the clock in the manner of an alarum. In the gardens of the Palais Royal and the Luxembourg, at Paris, was in 1832 a cannon-clock, invented by one Rousseau. A burning-glass was fixed over the vent of a cannon, so that the sun's rays at the moment of its passing the meridian were contracted by the glass on the priming, and the piece was fired. The burning-glass was regulated for this purpose every month.

Brequet, the very celebrated watchmaker of Paris, contrived a clock to set a watch to time. This clock was of the size of those called chamber-clocks, having a fork and support on the top to carry the watch. When the clock struck twelve, a piece of steel, about the thickness of a small needle, was made to rise, and entering a hole in the rim of the watch-case, came in contact with a piece connected with that which carried the minute-hand, and by pressure made the hand of the watch correspond with that of the clock, provided the difference was not more than twenty minutes. The same ingenious artist constructed a chronometer for George IV., which had two pendulums, one for the purpose of making the machine show mean time, the other to make it act as a metronome, by beating the time for music. This pendulum was merely a small ball attached to a slight chain carried round a pulley. On the centre of the pulley was an index, which, when brought to any of the musical measures marked upon the scale, shortened or lengthened the chain, so as to cause the pendulum to perform its oscillations in the time required, and a hammer struck on a bell the beats contained in

each bar; these could be silently struck by placing a piece of wood between the hammer and the bell. The musical time was also indicated by the seconds-hand of the clock.

In Sir John Soane's Museum is an astronomical clock, by Raingo, of Paris, which formerly belonged to the late Duke of York.

We read in the 'Gentleman's Magazine' for 1828, that a clockmaker of Memmingen had announced for sale a clock of his own invention, which had employed his exertions for thirteen years. It was made of wood, and had nothing metallic in its composition; it required to be wound-up only once in three months; and a report as loud as that of a twelve-pounder announced the time when it had stopped. The inventor, M. Pipert, warranted it for twenty years, and asked six thousand ducats for it. The Grand Duke of Hesse had offered him five thousand, which amount he had refused.

Babbage, in his 'Economy of Manufactures,' 1835, in reference to the possibility of performing arithmetical calculations by machinery, and to his general principle "that nearly all tables of numbers which follow any law, however complicated, may be formed, to a greater or less extent, solely by the proper arrangement of the successive addition and subtraction of numbers befitting each table," says: "Let the reader imagine three clocks placed on a table side by side, each having only one hand, and each having a thousand divisions instead of twelve hours marked on the face; and every time a string is pulled, let them strike on a bell the numbers of the divisions to which their hands point. Let him further suppose that two of the clocks, for the sake of distinction called B and C, have some mechanism by which the clock C advances the hand of the clock B one

division for each stroke it makes upon its own bell; and let the clock B by a similar contrivance advance the hand of the clock A one division for each stroke it makes on its own bell. With such an arrangement, having set the hand of the clock A to the division I., that of B to III., and that of C to II., let the reader imagine the repeating parts of the clocks to be set in motion continually in the following order: *viz.* pull the string of clock A; pull the string of clock B; pull the string of clock C. The table . . . . will then express the series of movements and their results. If now only those divisions struck or pointed at by the clock A be attended to and written down, it will be found that they produce the series of the squares of the natural numbers. (*See Table, next page.*)

More moral philosophy grounded upon horology. Hazlitt, writing in 1838, said:—"The mind of man is like a clock that is always running down, and requires to be as constantly wound up. The ideal principle is the master-key that winds it up, and without which it would come to a stand: the sensual and selfish feelings are the dead weights that pull it down to the gross and grovelling."

We read under date 1840, that at the Hermitage and Winter Palaces at Petersburgh, was a collection of ancient clocks and watches studded with diamonds; and among the former was an extraordinary organ clock, that played beautifully. It cost the maker years of labour, and at last, as no one would buy it, a lottery was made, and it was won by the wife of a poor pastor. The court gave her forty thousand roubles as a premium for it.

To aid the cook in her important work a Mr. Loudon, in 1840, caused to be made from his own designs an

Repetitions of Process.	Movements.	Clock A. Hand set to I.	Clock B. Hand set to III.	Clock C. Hand set to II.
		Table	First difference.	Second difference.
1	Pull A.	A strikes . . 1		
	— B.	The hand is advanced (by B) 3 divisions.	B strikes . . 3	
	— C.	. . . . .	The hand is advanced (by C) 2 divisions.	C strikes . 2
2	Pull A.	A strikes . . 4		
	— B.	The hand is advanced (by B) 5 divisions.	B strikes . . 5	
	— C.	. . . . .	The hand is advanced (by C) 2 divisions.	C strikes . 2
3	Pull A.	A strikes . . 9		
	— B.	The hand is advanced (by B) 7 divisions.	B strikes . . 7	
	— C.	. . . . .	The hand is advanced (by C) 2 divisions.	C strikes . 2
4	Pull A.	A strikes . . 16		
	— B.	The hand is advanced (by B) 9 divisions.	B strikes . . 9	
	— C.	. . . . .	The hand is advanced (by C) 2 divisions.	C strikes . 2
5	Pull A.	A strikes . . 25		
	— B.	The hand is advanced (by B) 11 divisions.	B strikes . . 11	
	— C.	. . . . .	The hand is advanced (by C) 2 divisions.	C strikes . 2
6	Pull A.	A strikes . . 36		
	— B.	The hand is advanced (by B) 13 divisions.	B strikes . . 13	
	— C.	. . . . .	The hand is advanced (by C) 2 divisions.	C strikes . 2

egg-clock, which rung a bell or set off an alarum at intervals of any number of minutes. It had a dial rather larger than that of a watch, with five divisions representing five minutes, and surmounted by an alarum bell. This instrument being fixed over the kitchen fireplace, the index was moved to the number of minutes that the egg was to be boiled, and during the boiling the cook might be busy about her work until the alarum sounded. The act of moving the index or pointer wound up the clock. The principle might be applied to a larger dial, and cooking operations be performed by it to the greatest nicety.

Electrical clocks, by which time may be transmitted, are among the marvels of this day. For the purpose of sending time by one of these machines, the indicator is fixed, and furnished with a clock face, the axis carrying an index or hand; the communicating disc is moved round by the oscillations of a pendulum, which is kept going by the potent fluid, electricity. In this way one good clock can be made to communicate its own time to a series of skeleton clocks at any distance. In the 'Philosophical Magazine' for 1814 is a description of a galvanic clock by Francis Reynolds, of Hammersmith. About the year 1840 Professor Wheatstone exhibited before the Royal Society an electo-magnetic clock, the object of which was stated to be to enable a single clock to indicate exactly the same time in as many different places distant from each other as might be required. In this clock the parts connected with the maintaining and regulating power were dispensed with. It consisted simply of a dial with second, minute, and hour hands, and a train of wheels communicating motion from the arbor of the seconds-hand to that of the hour-hand in the same manner as in an ordinary

clock train. A small electro-magnet was made to act upon a wheel placed on the seconds-arbor in such a manner that, whenever the temporary magnetism was either produced or destroyed, the wheel, and consequently the seconds-hand, advanced one sixtieth part of its revolution. Thus, by alternately completing and breaking the electric current every second, this machine would perform all that was accomplished by an ordidary clock. Alexander Bain, of Edinburgh, Appold, and others, also produced forms of electric clocks, in which the current from the voltaic or earth battery was made to supply the place of the spring or weight commonly used as the maintaining power. In these clocks the alternate attraction and repulsion of magnets has been made to act directly on the pendulum, the bob of which is a coil of insulated wire, through which the electricity passes at intervals. While the current is being transmitted the pendulum is attracted by the magnet, and made to produce an oscillation, during which a pin projecting from the pendulum rod pushes a sliding bar from off certain conducting surfaces upon which it rests, and thus breaking the contact, the electric coil or bob loses its magnetism, and ceases to be attracted by the permanent magnet which a moment before had deflected it. It therefore falls back into the vertical, and by its momentum performs the opposite oscillation; but in doing this the pin again comes into contact with the sliding bar, and restores it into the position in which the circuit is completed. The coil is again electrified, and consequently again in a condition to be attracted by the magnet. In swinging up to it contact is again broken; attraction again ceases; the pendulum swings back again; and in this way it is kept vibrating, and by its vibrations

communicates motion to the scapewheel, or other contrivance, and then to the clock-train.

One of the latest arrangements of the electric clock was contrived by Shepherd; to whom it occurred that if, instead of applying the magnetic power directly to the pendulum, it were employed on the principle of the remontoir escapement to bend a spring to a certain fixed extent during each vibration, such spring in unbending would give the necessary impulse to the pendulum The pendulum, the clock-train, and striking-part has each its own separate and distinct system of electro-magnets and voltaic battery, so that the pendulum may continue to oscillate, although the clock movements may be at rest. The striking-part is also under the control of the pendulum and the train, although moved by its own electric power. One of the peculiarities of Shepherd's clock is, that the pendulum does not depend for its motion, as in common clocks, upon the train of wheels, nor is it the maintaining power. If anything is to be let off by electricity at a given second in every day, the requisite precision is obtained by Shepherd's machine thus:—There are pins for making contact with springs in the minute wheel, the hour wheel, and the twelve-hour wheel, and it is only when the contact is made with all of them at once that the circuit is complete. In this way the time-ball on the top and outside of Greenwich Observatory, and also others in London in connection with it, are let fall at one o'clock every day, by the clock pulling the trigger of a temporary magnet. The ball in use at Greenwich is raised half-way up the mast upon which it slides at five minutes to one o'clock daily. At three minutes to one it is raised fully to the top, and it remains there until the instant of one, when it suddenly falls. The time-ball is a large

covered basket of wicker-work, and it descends with a piston plunged into a tube with a bell-mouth, to facilitate the entrance; and the piston compressing the air as it goes down, which acts as an elastic cushion to the ball, makes it drop without concussion. There is a small hole at the bottom through which the air afterwards gradually escapes.

In consequence of the use which has been made of electricity in horology, time is now laid on to public and private establishments, and paid for as water or gas might be. A system of time-distributing clocks has been in use for about twelve years at Greenwich Observatory. In that establishment are six of such clocks, and one outside at a distance of four hundred yards, and one also at London Bridge, all of which are maintained in perfect unison by the action of only one pendulum. Every hour throughout the day and night time-signals are sent by wires from Greenwich to various public and private establishments in London and elsewhere. In addition to this, horological electricity performs the office of dropping time-balls, similar to that at Greenwich, where the parent electro-magnet clock is, at various places in London, and also at Deal. It moreover fires time-guns at Shields and Newcastle; and exhibits an hourly signal in the clock-room at Westminster Palace, to enable the attendant to correct any errors which may happen in the great clock there.

In the 'Mirror' for 1841 are "Some observations on clocks and watches; with an excellent moral attached, and a proposition for lengthening life thirty-six hundred times," as follows:—

"How Oxford folk may measure time is hard to understand,
Since of their public clocks each one hath only got one hand:

But Clocks have generally two, like any dame or dandy;
And, faith, to me the latter plan seems vastly much more handy.
How strange and complicate a frame a watch's or a clock's is;
Made up of little crooked wheels and crooked paradoxes!
'Time keepers' truly! they 'catch'd a Tartar,' neck and crop;
They *keep* time whilst they *go* with him, but cannot when they stop.
Some clocks and watches have *three* hands by which the time is reckon'd:
But strange! the *third* in such a case is always called the *second*;
Oh can the bard explain a watch, nor can you understand one!
Which even when 'tis wholly new, is still a second hand one;
Nor in these little indices is much to make us ponder;
For what we mete with so much care, it were not wise *t*' squander:
A minute, though a time minute, to waste was never so meant,
Nor think that even a moment is a matter of no moment.
The best of ways, the song declares, to lengthen out our days,
Is stealing hours from night; but *that* is *not* the best of ways:
I have a plan to lengthen life of more peculiar powers—
To seize the minutes as they pass, and make the moments *hours*.
Then take your time-meter with you wherever you may travel;
The hour for meat, or drink, or rest, or toil, it will unravel:
'Tis meeter I can say from old experience; and 'tis sweeter,
For did the Muse not mete her verse, her verse would not be metre."

Robert Moffat, in his 'Missionary Labours and Scenes in Southern Africa,' 1842, writing of a missionary settlement there, tells us that "At an early period, when the place of worship was built, a wooden Dutch clock had been fixed upon the wall, for the purpose of regulating the hours of worship. Immediately above the dial was a small box, in which were a couple of Lilliputian soldiers, who strutted out when the clock struck. Conrad Buys, and others, had poisoned the minds of some of the leading men with the idea, that the missionaries were only the precursors of the Govern-

ment, who would soon follow in their train, and make soldiers of every one of them. The little images in the clock were soon magnified into Goliaths, and the place of worship looked upon as an eintlu ea Kholego, a house of bondage. It was necessary to take down the fairy-looking strangers, and cut a piece off their painted bodies, to convince the affrighted natives that the objects of their alarm were only bits of coloured wood. Many, however, thought themselves too wise to be thus easily deceived. Though perfectly convinced of the egregious folly of believing that the little *liséto*, 'carved ones,' would one day seize them by the throat in the sanctuary, they nevertheless continued to suspect that the motives of the missionary were anything but disinterested."

In one of the towers of Bayon's Manor, Lincolnshire, the residence of the D'Eyncourt family, are placed a clock and deep-sounding clock-bell, which was cast in 1842, immediately after the death, at Barbadoes, of Captain Eustace D'Eyncourt, aged twenty-five, who fell a victim to yellow fever within a few days after he had arrived from England to join his regiment. His father, Charles Tennyson D'Eyncourt, now deceased, caused the following lines to be inscribed on the bell in question, which is supposed to speak:—"Me posuit Carolus de Eyncourt, filium, flora ætatis abreptum, Eustachium dilectissimum deflens. Revocet vox mea dulces amoris horas:—Moneat quoque—quam fugaces! Quantula sit Vita!"

The Royal Exchange clock is the most remarkable one in London, and has been taken as a pattern for other turret-clocks, including the great one at Westminster. The architect of the Exchange, William Tite, in his report on the building in October, 1842, mentions

the desirability that there should be a first-rate turret-clock in the tower. In accordance with that report the committee wrote to Mr. Airy, the Astronomer Royal, in 1843, upon the subject; who replied that special conditions should be laid down as to choice of materials, construction, arrangement of bells and chimes, and such like; and that if the committee thought fit, his opinion or certificate should be obtained as to the workmanlike character of the clock. These suggestions were followed out, and in the month of July, in the same year, several eminent clockmakers were written to for tenders. Among those who tendered were Whitehurst, of Derby, and the late Mr. Dent. On July 28th, 1843, the committee met at Mercers' Hall to open the tenders, six in number, when Mr. Dent was the only candidate who was called before the committee; and as his tender was about half the amount of the others, he was appointed to make the clock. By the contract the clock and chimes were to have been fixed and completed by May 31st, 1844; but this period was far exceeded. Mr. Dent had then no factory of his own for making large clocks, and therefore depended upon getting it made according to his directions by some experienced turret-clock makers; but his application to them was refused. Mr. Dent found himself unable to get this clock made for him; but with the energy and genius by which he raised himself from a tallow-chandler's apprentice to the position of the first horologist in the world, he at once set up a factory for himself at Somerset Wharf, Strand; and there with tools worth about 2,000*l.*, expressly made for the purpose and under his personal directions, he had manufactured the clock, the first turret-clock that he had constructed. And of this the Astronomer Royal certified, in 1845, that it not only

satisfied his conditions, but that Mr. Dent had made some judicious improvements upon his suggestions, and that he had no doubt it was the best public clock in the world. The construction of the Exchange clock was too expensive for general use, and Mr. Dent devoted himself to simplifying it.

The trains are contained within a strong cast-iron framing, in which every strain is so completely self-contained, that the operation of fixing the clock was easy, nothing more than a firm flat base being required for the framing to rest on. Hollow iron drums are used instead of wooden cylinders for the driving barrels; and wire instead of hempen ropes are used for suspending the weights. The first of these improvements ensures a more permanent accuracy of form; and the use of the wire-rope allows a smaller cord to be employed, and thus prevents the necessity for overlaying. In this way the weight exerts the same force to turn the barrel, which is not the case with a thicker rope covering the barrel in two or three layers. In this clock the hands are driven, and the hammers of the striking-part are raised directly from the axis of the driving-barrel, without the intervention of wheels and pinions. The pendulum is compensated, and the first stroke of the hour is true to a second. For this purpose the lever and hammer are removed to their greatest distance before the time of striking, and the end of the lever remains delicately poised upon the rounded point of the projecting tooth of the pin-wheel until the exact time for striking has arrived, when it is released on the instant. The centre rod of the pendulum is of steel, of sufficient length to pass through the bob or weight, which, however, is not immediately attached to it. Upon the bottom of the rod is fixed a nut, by

turning which the length of the pendulum may be adjusted to a great nicety. Upon this stands a hollow column of zinc, through which the steel rod passes freely. On the top of the zinc column is a metal cup, from projecting portions of which descend two slender steel rods, to the lower ends of which the weight, which is a hollow cylinder of iron, capable of sliding freely on the zinc column, is suspended. Thus, while both the central steel rod and the two smaller steel rods by which the weight is suspended expand downwards upon any increase of heat, the position of the weight in reference to the point of suspension of the pendulum remains nearly the same, because the zinc column, although shorter than the central steel rod, expands to an equal extent upwards, and consequently raises the weight just as much as it is depressed by the lengthening of the steel rod. As the pendulum weighs nearly four hundredweight, the operation of setting it so that its vibrations might be correct within the fraction of a second was a matter of extreme difficulty. This was met by a contrivance which was suggested by Mr. Airy. The clock being started at a very losing rate, a slender spring, so mounted as to touch the pendulum slightly, and thus by diminishing the arc cause the clock to gain, was brought into contact with the pendulum bob, nearly at the centre of percussion, by means of a line in the clock-room. By this course the beats of a large turret-clock may be brought to coincide perfectly with those of a chronometer by which it is set. The clock has a remontoir escapement, and the pallets are jewelled with large sapphires. Mr. Airy's construction of the going-fusee is also introduced, maintaining the clock during the winding.

The present Royal Exchange as a structure is in

every respect superior to the first; but it has an especial advantage over its predecessor with regard to the clock; for while the present edifice contains a clock which for its general accuracy is the model of a timekeeper, the Bourse or Exchange which Sir Thomas Gresham built had in its lofty tower one of such inferior make, that its inaccuracy often caused the citizens of London grievously to complain. At the Cornhill ward inquest in 1598, and again in 1624, were "the dyall and clock of the Exchange pr'sented;" and in 1624 "the Exchange clocke was presented for not being kept well, it standing in one of the most eminent places in the cittie, and being the worst kept of any clocke in that cittie." This clock had four dials, chimes, and four wind dials. The chimes played at three, six, nine, and twelve o'clock; on Sunday, the One hundred and fourth Psalm; Monday, 'God save the King;' Tuesday, 'Waterloo March;' Wednesday, 'There's nae luck about the house;' Thursday, 'See the conquering hero comes;' Friday, 'Life let us cherish;' and Saturday, 'The Foot Guards' March.' On January 10th, 1838, the Exchange was entirely consumed by fire, the clock-tower alone remaining. The dials indicated the exact time at which the flames reached them—north at twenty-five minutes past one; and south at five minutes past five. The last air played by the chimes at twelve was the very appropriate one of 'There's nae luck about the house.' The chimes of the present Exchange clock consist of a set of fifteen bells, made by Mears, which cost 500*l.*, the largest being also the hour-bell of the clock.

Surrounding the exterior of the old Exchange were shops, some of which were occupied by watch and clock makers. In the 'London Gazette' for February 13th,

1678, we find the following advertisement by a watchmaker, of the Royal Exchange, who had lost his apprentice:—"Nestor Holmes, aged about 18, middle stature, brown lank hair, fresh colour'd, a stubbed nail on his right thumb, had a sad colour'd coat on, the sleeve faced with red, went away from his Master, Capt. Jermy Gregory, Watchmaker at the Royal Exchange, the 31 of January last. Whoever can secure him into the custody of his Master, shall have Forty shillings reward."

As to the General Post Office clock, B. L. Vulliamy writes:—"I will briefly notice the clock at the new Post Office, because it is considered a very beautiful specimen of the art on a small scale, on account of the weight of the pendulum bob, which is 448 lbs., requiring a maintaining power of only 33 lbs. to cause it to vibrate 2′ 20″, on each side of zero; this weight, considering that it is for an eight-day clock, which is much encumbered with rod work, and labouring under manifold disadvantages consequent upon its ill-constructed situation, is, in reference to the weight of the bob, an extremely small motive power."

The maker of the clock at the Cremille Victualling Office, near Plymouth, B. L. Vulliamy, described it in 1847 as follows:—"This eight-day clock, which strikes the quarters as well as hours, was made under the immediate direction of Sir John Rennie, and, though somewhat limited for space, is in every respect a very perfect piece of work. The time is shown upon four very large faces, and there are probably few clocks to be found in so exposed a situation. This clock may be said to face the Atlantic, and to brave the storms of the Western Ocean. It stands at the head of Plymouth Sound; and a straight line drawn from the clock across the centre of

the breakwater would cross the ocean, and only terminate on the coast of America. All persons conversant with the south coast of this island are aware of the violence of the gales of wind which occasionally visit Plymouth Harbour. Though much confined for room, the general arrangements of this clock are everything that I could wish; it has a two-seconds pendulum, with a bob weighing 258 lbs., yet the weight of the maintaining power, calculated with a single line, is only 26½ lbs. The scape-wheel of the clock carries a seconds-hand to show time within, and a degree plate is employed to indicate the arc of vibration of the pendulum; consequently there is not any difficulty in determining exactly the deviations of the clock from mean time. The mode employed for communicating the motion from the clock to the hands is simple and convenient, and has not on any occasion got out of order. This clock, notwithstanding its exposed situation, has kept time so correctly as to become the standard for regulating time in all the Government establishments at Plymouth, Devonport, Stonehouse, and all other public clocks in the neighbourhood."

At a meeting of the Society of Antiquaries, held on December 7th, 1848, Mr. B. L. Vulliamy presented to the society a regulator clock, which had been made by his great-grandfather and grandfather, the former of whom was clockmaker to George II. The construction of the body of the clock and of the pendulum was that known by the name of Harrison's.

Benjamin Lewis Vulliamy, of Pall Mall, F.R.A.S., F.R.G.S., Associate of the Institute of Civil Engineers, and watch and clock maker to the Queen, the office of Woods, Ordnance, and Post Office, died on January 8th, 1854, aged seventy-four. He was the son of a gentle-

man of the same name, who was before him clockmaker to the Crown, and whose family held that appointment by royal warrant for one hundred and thirty years, and conducted their business in the same house in Pall Mall. Mr. Vulliamy pursued the art in a very scientific spirit, and wrote much on matters connected with it. He left two sons and one daughter.

CHAPTER VI.

Stollenwerk Clock at Stowe — Shakespeare Clock — Renaissance Clock — Wooden Clock made by a Belgian Peasant — Clock Time Map — Old Clocks and Old Clockmakers — Clocks in the Great Exhibition of 1851 — Alpha Clock — Clock Bed — Shepherd's Electric Clock — Clock from Paris Exhibition of 1855 — Westminster Palace Clock — Clock Omen — Huge Clock Bells — Musical Clock Bed — Perpetual Clock — Clock Lock — Self-Winding Clock — Camel Clock from Pekin — Clocks in the International Exhibition of 1862 — Clocks without Dials — Dutch Clocks — Dutch Clockmakers — Clock Chimes in the Low Countries — Antwerp Cathedral Chimes — Belgium Clocks — American Clocks — The Old Clock on the Stairs — French Clocks — Japanese Clocks — Atmospheric Clock — Clock without visible Works — Clocks imported into England — Proverbs relating to Clocks — Folk Lore of Clocks — The Legend of Blownorton Clock — Tempus Fugit.

At the Stowe sale in 1848 a magnificent Huygens clock, made by Stollenwerk, was sold to Mr. Paxton for only fifty-one guineas, although it was said to have cost the Duke of Buckingham one thousand. The case was of the most exquisite marqueterie, and was also enriched with well-executed figures of boys, trophies, and masks in ormolu. The outline of this choice article was thoroughly good, and the beauty of the several decorations renders the small sum that it fetched remarkable.

At an exhibition of select specimens of British manufactures and decorative art, given by the Society of Arts in 1848, Summerly exhibited the Shakspeare Clock, which was designed and modelled by Bell, and made in Parian by the Mintons; the works were to be furnished by Vulliamy; the dial was to have Drayton's silvering

process; and was placed between two figures representing Tragedy and Comedy, as typical of Time passing between Joy and Grief:—

"Joy absent, grief is present for that time."—*Richard II.*

The composition was surmounted by a statuette of Shakspeare, the likeness being founded upon his bust in the chancel of Stratford Church.

At an exhibition of ancient and mediæval art, given by the Society of Arts in 1850, Mr. Baring Wall, M.P., exhibited a curious little silver-gilt clock in the style of the Renaissance. It was surmounted by a figure of Cupid, who held a very long arrow, with which he pointed to the hours marked upon the edge of a dome on which he was seated. The dial circle was at the top of the clock, below the Cupid, and not at the side as in ordinary clocks.

In a number of the 'Brussels Herald' for the year 1851, appeared the following account of an ingeniously constructed wooden clock, which was made by a poor Belgian peasant, and by him called "The Moving Calendar:"—"There are several dials to mark the hours, minutes, seconds, and days of the week, the day of every month, the months of the year, the years and centuries, the rising and setting of the sun, moon, &c. The works are encased in glass, and are so arranged that they may be inspected, leaving no doubt on the mind as to the execution of the workmanship or regularity of the movements. About the dials and galleries there is a gallery about a yard in length, with cells in the centre, and a tower at each end. When the clock is about to strike, the door of one of the cells opens, and the figure of Death appears armed with a scythe, followed by the figure of our Saviour with a whip in his hand, who

drives the enemy before him, and finally thrusts him into another cell. At the first stroke of the clock a little cock, perched on the cross of the steeple, flaps his wings and stretches out his neck as if in the act of crowing. As soon as the clock has finished striking, the different figures return to their respective cells, taking care to close the door behind them. Thrice a-day, at six a.m., twelve at noon, and six p.m., by means of ingenious mechanism, the sound of the Angelus is heard. The Holy Virgin leaves her cell, appears on the gallery, and withdraws to an oratory. At the same time an angel descends from one of the towers and places himself under the Virgin, bending in the act of salutation. The Virgin Mary is made to appear disconcerted, trembles, and shows signs of deep emotion, after which the angel resumes his former position and performs the same movement twice. All the works of this admirable machine are of wood or brass, and remarkably well executed. The inventor designed and carried out his plan without assistance. During the day he worked in the fields, and at night, by lamplight in a corner of his garret, he constructed this extraordinary clock."

In 1851 Ellis and Son, watchmakers, of Exeter, published a very interesting map showing the time kept by public clocks in various towns in Great Britain. Among many other curious notes which may be made on this subject, we may mention that it is Sunday in Inverness and Glasgow nearly seventeen minutes earlier than it is at Plymouth; and it will be 1867 in Liverpool eleven minutes before it will be so in Bristol.

A correspondent of 'Notes and Queries' for 1851 said that he had in his possession an apparently very old, although very elegant and excellent, eight-day clock,

with the maker's name on its face, Thomas Lestourgeon, London. It was then a century old. Some years previously there was found among the apparatus of the nautical philosophy class in the University of Edinburgh, an instrument called in the inventory "An old watch, maker's name Lestourgeon, London." Another correspondent of 'Notes and Queries' for 1854, stated that he had in his possession, and in use, a clock bearing on its face the name of Orpheus Sumart, of Clerkenwell. The works were of wood, and its mechanism extremely simple. It was more than a century old, and was regarded as a piece of ancient family furniture. The following clockmakers' names are to be seen on various elaborate and curious antique clocks:—Samuel Dunkerley, James Boyce, Aclander Dobson, and John Hallifax, all of London. The latter name is on a very curious chime-clock.

The Universal Exhibition of 1851 was the means of bringing under the notice of the public many rare, beautiful, and unique specimens of the horologist's art, which otherwise might have remained unknown. We shall not attempt to catalogue all the works of this kind which were exhibited; but we will shortly describe some of the most notable among them. The following notes refer to clocks only; we shall describe the watches in due order:—

John Page, of Bury St. Edmund's, exhibited a fine skeleton clock twenty-eight inches in height, which required only once winding in three years. The power was obtained by six springs of the united force of two hundred and fifty pounds, which were enclosed within as many brass barrels; three of the springs were connected by chains to a fusee on the right hand, and three on the left hand. The power was thus concentrated in

the pinion of the second great wheel, and was conveyed up the train of wheels and pinions to the pallets which were connected with the pendulum, the power being reduced to that of a few grains; yet it was sufficient to keep the pendulum in constant motion. After the clock was first wound up, the chain was unwound from the smallest part of the fusee, three turns of which allowed the barrel to revolve once in two hundred and ten days. This was believed to be the slowest motion ever produced. By this clock the day of the month and the number of weeks and years during the time it had been going were registered. A spirit-level was attached to the base, so that the clock might be placed for a certainty in a vertical position. Page also exhibited a pyramidical-formed skeleton timepiece, twenty-eight inches high, which went three months with only once winding. The hour-dial was placed at the bottom, in order to display the wheels in motion. It had Graham's dead-beat escapement. The hands were moved by novel but simple mechanism.

William Turner exhibited a clock showing simultaneously the time in London, Edinburgh, Dublin, and Paris. And similar inventions were exhibited by foreign competitors. J. Driver, of Wakefield, exhibited a handsome skeleton clock, which struck on eight bells, and was supported by four lions made of terra-cotta. By this clock the time in any part of the world might be ascertained at pleasure.

A large transparent skeleton spring timepiece was contributed by J. Edwards, of Stourbridge. Some of the wheels were constructed of brass and glass connected together, a novelty in horology.

Sanders Trotman had a curiosity in the shape of a night-lamp time-indicator; the regular consumption of

camphine being the power employed to tell by means of an index the time of night.

A portable spring time-keeper, which required only once winding up in four hundred and twenty-six days, was exhibited by J. T. Edwards, of Dudley.

A working shoemaker, resident in London, invented, made, and exhibited a thirty-two day skeleton time-piece, with detached escapement, having fewer works than usual. A tailor exhibited a clock which showed the days and months, the motions of the sun and moon, and the tides in many parts of Europe. It went for twelve months. A blacksmith contributed a musical clock, which played a tune every three hours.

George Taylor, of Wolverhampton, exhibited his perpetual self-correcting date-clocks, in which the day of the month, the month, and the day of the week were all shown in recessed openings under the dial.

J. Briscall, of Birmingham, exhibited a one-month clock. In addition to the ordinary dial, it had an almanack attached, and was self-regulating, so far as the months and the extra day in Leap-year were concerned.

"Tempus rerum imperator" was appropriately painted on the dial of Lovelace's unique astronomical clock, known as the Exeter Clock, which extraordinary example of patient industry and consummate skill on the part of poor Lovelace took him thirty-four years of his life to accomplish. He died in great poverty. This clock was five feet in width, ten feet in height, and weighed about half-a-ton. Two sets of figures in the hour-circle surrounded the dial, namely, from twelve at noon until twelve at night, and from twelve at night until twelve at noon. The shape, size, and age of the moon were very cleverly shown; the month

and the day of the month were also indicated. The clock required to be regulated only once in one hundred and thirty years, struck the hours and chimed the quarters. The times of sun-rise and sun-set were also shown by means of an horizon, which receded or advanced according to the season of the year. Once in every four hours a psalm-tune was played, an index at the same time pointing to the name of the tune. During the playing, two moving figures, Fame and Terpsichore, were seen in motion, keeping proper time.

An eight-day striking clock, with only one mainspring, and one train of wheels to do all the work, including the striking, which was performed on one bell placed at the top, was exhibited by William Harvey, of Stirling.

Whishaw exhibited a centrimetal chronometer or velocentimeter, which was intended for ascertaining most accurately merely by observation the velocities of railway engines and trains. A movable ring surrounded the dial, and contained velocities calculated on the standard of one thousand three hundred and twenty feet, or a quarter of a mile. It was furnished with a central dead hundredths hand; so that by moving zero on the ring in a line with the central hand, at the instant of passing one of the quarter-of-a-mile standards and then reading off the marginal figures at the instant of passing the next quarter-of-a-mile standard, the velocity due to the quarter of a mile passed was accurately given. The ring was movable, so that for taking velocities on foreign railways, a kilometral or other scale might be substituted at pleasure.

Roberts's Alpha clock was one of the novelties of the Exhibition. It was called the Alpha from its shape resembling an A. The wheels and pinions were made

of cast-iron, with teeth retaining the scale. It had only one weight to actuate both the going and the striking trains; and the chain or cord, requiring no lateral traverse, could be taken off in any direction. The compensation pendulum and the remontoire escapement were adapted to keep the clock at an almost uniform rate: whilst the hands, being advanced at intervals of thirty, or, if desired, sixty seconds, afforded an opportunity for ascertaining the time to a second. The striking of the hour was effected through means by which the blows were given at equal intervals of time, thus avoiding irregularity and expenditure of power to direct it.

Lucien Marchand contributed a curious musical clock, which required winding only once a month. It had independent seconds. On one side was a magician with a wand, who at certain intervals rose from his seat and pointed to an answer to any of twelve set questions which might be proposed, the whole being arranged in connection with the clockwork. On the other side was a bird perched on a tree, which sang at certain intervals. The music was from four popular overtures.

Another artist displayed a timepiece of clockwork consisting of a pillar, the spring capital of which opened when touched, and up jumped a pea-sized bird, which fluttered its wings and chirruped for two minutes.

Frodsham exhibited a very elegant clock, upon a slab supported by an eagle. Above the clock was an ornament composed of a broken pillar, the work of time; and a serpent, the emblem of eternity.

Miss Walter exhibited a curious and fanciful design for a clock-face, in which the virtues and vices were arranged in two distinct circles. The former were the inner, next the eye and ear of Omniscience; the latter

were the outer and darker circle, denominated Satan's Kingdom.

The inventor exhibited a clock or alarum bed, which turned its occupant out at any period that he might have previously set the clock and its machinery to. It was represented to be valuable to military men, sportsmen, travellers, and others, and all whose pleasure or duty required early and punctual rising. It was perfectly noiseless, as the alarum did not strike, but gently tilted the sleeper into an upright position.

R. and J. Moore exhibited a large and showy clock, which was elaborate in internal workmanship and outside decoration. It went one month, chimed the quarters on eight bells, struck the hours on a deep-toned bell, and played twelve tunes, shifting by the action of the clock to a fresh tune every hour. The frames of the dial and the steel plate upon which the clock stood were enamelled upon a new principle. The base was carved in walnut-wood. The ornamentation was of mixed character, and rich and effective.

Elkington and Company exhibited the Hours Clock-case, so called from the fact of the face being embellished with a bas-relief representing the twelve hours circling round the clock, which itself had an enamelled dial representing the sun, its centre being a flying phœnix, which we are told was born anew every five hundred years. At the base were two figures, respectively illustrative of repose at evening, and the wakening to labour in the morning. The apex was crowned with a figure of Psyche, or the soul, looking upward, emblematic of eternity. The whole was prettily conceived and pleasingly designed. This work was executed in electro-bronze.

A turret-clock with many improvements, manufac-

tured and exhibited by Smith and Sons, was one of the most striking features of the horological section. The same firm exhibited a four hundred-day timepiece, a detector clock or watchman's timepiece, and clocks for China and Turkey. Many of the clocks exhibited in the foreign department, in addition to the hour, minute, and seconds hands, had also the means of indicating the days of the week and month. In Messrs. Smith's four hundred-day clock, which was worked by a spring and had a mercurial pendulum, were the same useful additions. The detector clock could be made a complete check to irregularity and neglect of duty on the part of watchmen, as their absence could be correctly registered on the dial. The registering apparatus consisted of a revolving circular frame, fitted with springs and steel pins; and its general appearance was that of an ordinary-sized bracket-clock. In the ordinary telltale-clock are a number of pins sticking up round the dial, one for every quarter of an hour; and it is the duty of the watchman on the premises where such a clock is kept to go to it every quarter of an hour, and push in the proper pin, to show his employers the next morning that he has not been negligent of his duty. Each pin admits of being pushed in during a few minutes only, and if not heeded, will be found sticking out, showing the exact time when the watchman was away from his post. In a telltale-clock in one of the lobbies of the House of Commons, the face and pins are enclosed behind a glass; and outside the clock-case is a handle, communicating with a small lever, standing over a part of the circle in which the pins move; and as the pins are carried round in a sort of movable dial, the effect of pulling the handle is to push the pin which comes under the lever every quarter of an hour. In these clocks the pins are made to

pass over an inclined plane some hours after they have been pushed in, and in this way are pushed out again. In the clocks for Turkey and China, exhibited by Smith and Sons, it had been found necessary to substitute brass chains for the ordinary gut lines or steel chains, so as to prevent the injurious effects of the climate of those lands. The figures on the dials were those of the countries for which they were constructed. In addition to the above, Messrs. Smith also exhibited the "Uniformity of Time Clock and Telegraph," which was invented by Francis Whishaw, a civil engineer, one of the uses of it being to regulate time between distant places to the hundreth part of a minute, by means of sounds transmitted by electrical agency. It also formed a telegraph, as there were four distinct alphabets and numerous signs and signals distinctly marked in red and black on the annular movable plate which surrounded the dial. There were four hands, which rotated together; one of these was distinguished from the others by being of a light colour, and was called the index hand, as by it the class of signals to be used was indicated. The other hands were used for pointing to the signals, which were thus more quickly given than if only one hand had been used. By two electrical bells, of dissimilar sound, the particular quarter of the dial on which the signals were to be read off was readily understood. Besides the telegraph dial and regulator, there was a second face with the ordinary hands, so that one side might be in the telegraph room of the railway station, while the other faced the booking office.

Shepherd's electric clock, which struck the hours with peculiar solemnity, was a remarkable feature of the Exhibition. In adapting this clock to the external design of the building, Owen Jones ingeniously con-

trived a plan by which the conventional form of a circle for the face of the clock was done away with, in order that the elevation of the south-end of the transept might not be disfigured. The clock face was a semicircle, having as usual twelve divisions, and the figure 12 was also as usual at the top of the circle, the numbers of 1, etcetera, likewise followed in the usual order; but, as with one hand only the semicircular dial would be left by the hour-hand for intervals of each alternate twelve hours, a second number 6 was added on the west side of the dial, and also a second hour-hand, which pointed to the number 6 on the west side as the first hour-hand left the number 6 on the east side. The hour-circle was twenty-four feet in diameter. The hands were of copper gilt. The minute-hand was sixteen feet long, purposely shortened so as not to descend below the fanlight frame. The thirteen figure-plates, which were of zinc, were secured to, and corresponded in shape with, the intersectional spaces formed by the second semicircular bar from the centre, and the radial bars of the great southern fanlight of the transept. The figures were painted white on a blue ground, in order to harmonize with the two prevailing colours of the external decoration of the building. The effect of Shepherd's improvements in the application of electricity to horological purposes was to attain a greater uniformity and certainty in the going of his clocks. The leading features in the Exhibition clock were the application of electricity to the winding-up of the impulse spring or weight, in order to render the escapement or impulse given certain in its action; and to improvements in effecting the movement of the train, in order to denote the hours, minutes, and other subdivisions of time. In this clock certain alterations in

the details of the magnetic apparatus was rendered necessary in order to suit the particular case. Besides the great clock for the transept, two dials of smaller size, one at the east and the other at the west end of the building, were also at work in connection with it. The electrical current to each of these auxiliaries was transmitted through copper wire coated with gutta percha. The mechanism of the clock was fixed in the south gallery of the transept, at about forty-eight feet below the centre of the dial, and motion was communicated to the hands by means of a rod made up of several lengths of brass tubing screwed together, and of one-and-a-half-inch in diameter. The clock frame was much lighter than usual, as the ordinary heavy weights were entirely dispensed with. There were two wheels within the frame, placed vertically, namely, the escape-wheel of ten inches diameter, to which the power was applied, and a larger or central vertical wheel, of eighteen inches diameter, working into the pinion on the arbor of the escape-wheel, which was in two parts, the teeth of each part being placed in opposite directions; on one part the click and ratchet escapement acted, being moved by the electro-magnets, while the teeth of the other part were employed to lock the train and prevent its running forward from the action of the wind on the hands. The large wheel revolved once in two hours, the spindle of which projected beyond the frame, and carried a bevelled wheel of twelve inches in diameter, placed vertically, which revolved within it. In order to give motion to the vertical rod already described, the bevelled vertical wheel worked in a second bevelled wheel placed horizontally; and above the first, on the axis of the horizontal bevelled wheel, the vertical rod or shaft revolved, and by means of wheel-work at the

top of the shaft the hands of the clock were also made to revolve. The whole was kept in motion by a series of powerful electro-magnets, eight in number, on which was wound a total length of twenty-five thousand feet of copper wire, the weight of which was nearly one-and-a-half hundred. Six small batteries were used in connection with the electro-magnets. Besides the twenty-four feet dial on the south side of the transept, two smaller dials already alluded to, each of five feet in diameter, were fixed in front of the galleries, at the east and west end of the building respectively, in the centre line of the main aisle or nave. All the dials were governed by one pendulum, which was kept in motion by a new plan. The magnet was employed merely to bend a spring at each vibration to a certain fixed extent, the reaction of the spring giving the necessary impulse to the pendulum, by which means the variations which were continually taking place in the batteries had no effect on the time measured by the pendulum. At the end of each vibration of that mechanism it came in contact with a small spring tipped with platinum, which completed the necessary circuit for giving motion to the several clocks. The impulse spring was screwed on to a brass stud fixed on the bed-plate, through a slot in which the pendulum vibrated. It had a small arm extending nearly at right angles, and a second arm that projected from the armature, which being attracted down by the action of the magnet, the poles of which passed through the bed-plates, the other end of the armature came in contact with the arm projecting from the impulse-spring, and raised it so as to lock the upper end in a detent, which was screwed on to the same stud as the impulse-spring. The pendulum in the course of its vibration

came in contact with the upper part of the detent, which it lifted up, thereby leaving the impulse-spring free to drop on the side of the pendulum, and follow it for a short space of its vibration, so as to give it the necessary impetus, forming what is technically called the remontoir escapement.

Samuel Warren, in his 'Lily and the Bee,' an apologue of the Crystal Palace of 1851, thus alludes to the great electric clock there:—

"Hark! A sound! startling my soul!
A toll profound!
The hollow tongue of Time,
Telling its awful flight,
Now, to no ear save mine!
Heard I ever here that solemn sound before!
Or did my million fellows hear, or note?
Now dies the sound away—
But upwaketh, as it goes,
Memories of ages past! The Gone!"

Byron tells us that—

"The hollow tongue of Time
Is a perpetual knell. Each toll
Peals for a hope the less!"

In the South Kensington Museum is a timepiece in ormolu and enamel, the upper part of which is formed by a globe enamelled in blue. Round the base are statuettes of the Seasons in ormolu. It was manufactured by Levy, frères, et C^ie^, of the Rue des Fosses du Temple, Paris. Its height is eleven inches and three quarters; and its width, twelve inches. It was exhibited in the Paris Exhibition of 1855, and was purchased for 19*l.* 4*s.*

We shall now give some account of the history of the Westminster Palace clock. In March, 1844, the late Sir Charles Barry applied to Mr. B. L. Vulliamy

for a specification and plan for a clock to "strike the hours on a bell of from eight to ten tons, and, if practicable, chime the quarters upon eight bells, and show the time upon four dials about 30 feet in diameter." On April 1st following, Mr. Vulliamy replied that the clock which he should propose as fit for the purpose would be very much the most powerful eight-day clock ever made in this country or in any other, but one which he should have no difficulty in executing. To fully carry out these intentions, he said he should visit many of the principal clocks at home and abroad. Shortly afterwards, however, Lord Canning, the principal Commissioner of Woods and Forests, applied to Mr. Airy, of Greenwich Observatory, for his advice upon the subject; and Mr. Airy recommended that Mr. E. J. Dent, of Cockspur Street, who was then constructing the clock for the New Royal Exchange, and Mr. John Whitehurst, of Derby, should also be applied to. This was done, and Mr. Dent, by letter dated November 14th, 1845, consented to be a competitor for the great clockmaking. Subsequently Mr. Vulliamy had cause, it seems, to retire from the competition, and Mr. Dent, having a friend in Mr. Airy, was entrusted with the order for the clock. The conditions upon which the competition was based were, in their original state, curious, and as they specially refer to the making of the largest clock known, we here append them :—

Conditions to be observed in regard to the Construction of the Clock of the New Palace of Westminster :—

I.—*Relating to the Workmanlike Construction of the Clock.*

1. The clock frame is to be of cast-iron and of ample strength. Its parts are to be firmly bolted together. Where there are broad bearing surfaces, these surfaces are to be planed.

2. The wheels are to be of hard bell-metal, with steel spindles

working in bell-metal bearings, and proper holes for oiling the bearings. The teeth of the wheels are to be cut to form on the epicycloid principle.

3. The wheels are to be so arranged than any one can be taken out without disturbing the others.

4. The pendulum pallets are to be jewelled.

II.—*Relating to the Accurate Going of the Clock.*

5. The escapement is to be dead beat, or something equally accurate, the recoil escapement being expressly excluded.

6. The pendulum is to be compensated.

7. The train of wheels is to have a remontoir action, so constructed as not to interfere with the dead-beat principle of the escapement.

8. The clock is to have a going fusee.

9. It will be considered an advantage if the external minute-hand has a discernible motion at certain definite seconds of time.

10. A spring apparatus is to be attached for accelerating the pendulum at pleasure during a few vibrations.

11. The striking machinery is to be so arranged that the first blow for each hour shall be accurate to a second of time.

III.—*Relating to the possible Galvanic Connection with Greenwich.*

12. The striking detent is to have such parts that, whenever need shall arise, one of the two following plans may be adopted (as after consultation with Mr. Wheatstone, or other competent authorities, shall be judged best), either that the warning movement may make contact, and the striking movement break contact, for a battery, or that the striking movement may produce a magneto-electric current.

13. Apparatus shall be provided which will enable the attendant to shift the connection by means of the clock action successively to different wires for different hours, in case it should hereafter be thought desirable to convey the indications of the clock to several different places.

IV.—*General Reference to the Astronomer Royal.*

14. The plans, before commencing the work, and the work when completed, are to be subjected to the approval of the Astronomer Royal.

15. In regard to the Articles 5 to 11 the maker is recommended to study the construction of the Royal Exchange clock.

These conditions bear date June 22nd, 1846, and on February 11th, 1847, in another communication to the competitors, Mr. Airy stated it was desirable that conditions 3, 7, 8, and 14, should "be fully complied with," because "the constructions to which they refer being not in extensive use in this country, they may, in the adaptation of ordinary plans to the new clock, be inadvertently passed over. But it is not intended that the stringency of the other conditions shall be in any degree relaxed." Afterwards he appended a new condition:—

16. The hour wheel is to carry a ratchet-shape wheel or a succession of cams, which will break contact with a powerful magnet, on the principle recommended by Mr. Wheatstone, at least as often as once in a minute, for the purpose of producing a magneto-electric current, which will regulate other clocks in the New Palace.

The tenders were sent in as follows:—Mr. E. J. Dent, August 8th, 1846 (conditions 1 to 15), 1,500*l.*; and March 15th, 1847 (including 16), 1,600*l.*; Mr. John Whitehurst, September 24th, 1846 (conditions 1 to 15), 3,373*l.*, and March 15th, 1847 (including 16), 3,523*l.* Mr. Vulliamy sent in designs, but he afterwards declined further to compete. Thwaites and Reid applied to the Commissioners for leave to tender, but the same was not granted. The clock now set up at Westminster was ultimately made by Mr. Dent, junior, from the designs of Mr. Denison, about 1855.

The four dials are twenty-two feet in diameter, and the figures upon them, thickly gilt, are relieved from a blue surface. These dials are considered to be the largest in the world with a minute-hand, which, on account of its great length, velocity, weight, friction, and the action of the wind upon it, requires at least twenty times more force to drive it than the hour-hand.

This clock goes for a week. The great wheel of the going part is twenty-seven inches in diameter; the pendulum is fifteen feet long, and weighs six hundred and eighty pounds; and the scape-wheel, which is driven by the musical box spring, weighs about half-an-ounce. All the wheels except the scape-wheel are of cast-iron, and all have five spokes. The barrel is twenty-three inches in diameter, but only fourteen inches long, as it does not require a rope above a quarter-of-an-inch thick. The second wheel is twelve inches in diameter. The great wheels have all one hundred and eighty teeth, the second wheel of the hour-striking part has one hundred and five, and a pinion of fifteen. The great wheels in the chiming part of the clock are thirty-eight and a-half inches in diameter. The clock is said to be at least eight times as large as a full-sized cathedral clock. It affords its keepers two hours' work a week in winding it up. It goes with a rate of under one second a week, in spite of any atmospheric changes. Respecting its present condition, Mr. Denison wrote to 'The Times' on August 11th, 1865, as follows:—"I may as well correct a mistake, which I often have to correct privately about the great clock. In consequence of the ambiguous language of another report of the Astronomer Royal, some people imagine that the clock is controlled by electric connection with Greenwich Observatory. It contains no machinery whatever for that purpose. It reports its own time to Greenwich by electrical connection, and the clockmaker who takes care of it receives Greenwich time by electricity, and sets the clock right whenever its error becomes sensible, which seldom has to be done more than once a month. Mr. Airy's last report upon the rate was 'that it may be relied on (that is, the

first blow of the hour) within less than one second a week;' which is seven times greater accuracy than was required in the original conditions." On October 1st, 1859, the great bell of Westminster sounded for the last time, and while in the act of striking it became dumb for ever. Its predecessor was similarly ill-fated.

Mr. Cowper stated in 1860 that 20,300*l.* had been spent on Westminster Palace clock up to that time, and that an additional sum of 1,750*l.* was in course of being expended.

A correspondent of 'Notes and Queries' for March 23rd, 1861, relates the following account of a curious omen or coincidence:—"On Wednesday night, or rather Thursday morning, at three o'clock, the inhabitants of the metropolis were roused by repeated strokes of the new great bell at Westminster, and most persons supposed it was for a death in the Royal family. There might have been about twenty slow strokes, when it ceased. It proved, however, to be due to some derangement of the clock, for at four and five o'clock, ten or twelve strokes were struck instead of the proper number. On mentioning this in the morning to a friend, who is deep in London antiquities, he observed that there is an opinion in the city that anything the matter with St. Paul's great bell is an omen of ill to the Royal family; and he added, I hope the opinion will not extend to the Westminster bell. This was at eleven on Friday morning. I see by 'The Times' this morning, that it was not till one A.M. the lamented Duchess of Kent was considered in the least danger, and as you are aware she expired in less than twenty-four hours . . . . . I am told the same notion obtains at Windsor." On April 1st, in the same year, at one o'clock in the dead of the night, the bells of this clock

struck thirty-seven. At two and three o'clock they gave the right numbers, but at four o'clock they were again erratic, and struck thirty-nine. On both occasions when these extravagant numbers were given, the striking of the hours commenced before the quarter-chimes, these coming in towards the close.

Apropos of our mention of the great bell on which the hours are struck by the Westminster clock, we may add that from the earliest times huge bells have been used for the sounding of the hours. For nearly three centuries has the number of them been struck upon the bell called Great Tom, at Christ's College, Oxford, by a heavy clock-hammer, weighing fifty-four pounds and a half. This bell is five feet nine inches in height, twenty-one feet in girth, and seven tons fifteen hundredweights, or rather over seventeen thousand pounds in weight, without the clapper, which weighs three hundred and forty-two pounds. The College clock-bell at Canterbury weighs three tons and ten hundredweights; the College clock-bell at Gloucester weighs three tons and five hundredweights; and the Minster clock-bell at Beverley, in Yorkshire, weighs two tons and ten hundredweights. The north tower of the Temple, formerly the Cathedral church of St. Peter, at Geneva, contains the great bell called Clemence, which is twenty feet in circumference round the base. A single blow struck on this bell announces daily the precise instant of noon, which is determined by a sundial placed on the western front of the Temple.

In 1858, a mechanic in Bohemia invented a musical clock-bed, which was so constructed that, by means of hidden mechanism, a pressure upon the bed caused a soft and gentle air of Auber's to be played, which continued long enough to lull the most wakeful to sleep. At the head was a clock, the hand of which being

placed at the hour that the sleeper wished to rise, when the time arrived the bed played a march of Spontoni's with drums and cymbals, and musical thunder enough to rouse the seven sleepers.

In 1858, a watchmaker named Chenhall, of Drake Street, Plymouth, exhibited in his shop-window a clock of the size of an ordinary eight-day clock, with a novel and very simple movement, which was said to be capable of going as long as the durability of the materials permitted, without the aid of weight or spring, and in short without any manual assistance whatever.

In 1859, a locksmith in Frankfort-on-the-Maine constructed a strong box without any key-hole at all, and which even the owner himself could not open. Inside was a clock-work, the hand of which, when the box was open, the owner placed at the hour and minute when he again wanted to have access to the interior of the box. The clockwork began to move as soon as the lid was shut, and opened the lock from the inside at the moment which the hand indicated. Time, dependent upon the owner, was the key to this clock-lock—a key that could neither be stolen nor imitated.

In 1859, after years of mechanical labour, James White, of Wickham Market, completed a self-winding clock, which determined the time with unfailing accuracy, continuing a constant motion by itself, never requiring to be wound up, and being capable of perpetuating its movements so long as its component parts should exist.

During the war in China in 1860, the Emperor's Summer Palace near Pekin was sacked by the allied forces, and much treasure was taken therefrom. Among the loot were many clocks and jewelled watches. A French soldier took a figure of a camel in solid silver,

nearly twenty inches high, bearing on its back a clock, and its hump being decorated with rubies, emeralds, and other precious stones. The statuette, on which the word "London" was engraved, came into the possession of a non-commissioned officer of the 101st Regiment, who refused seventy thousand francs for it. Lord Amherst's watch, worth 200*l.*, was seized, and sold by a French soldier for twenty dollars.

In the International Exhibition of 1862, in the middle avenue, was a clock by Benson, which struck the hours and quarters on five bells; the largest weighing twenty-two hundredweight. The works were three hundred feet from the dial, which was situated in the great central tower, the connections being carried underground. The weights exceeded a ton, and were two hundred feet from the works. A new remontoir escapement allowed the use of the great weight required to drive a clock of such size, so distant from the dial, and moving hands of such magnitude, sometimes in opposition to the wind. A two-seconds compensation-pendulum was employed. In the south-east transept was a turret-clock by Dent, which struck the hours on a bell weighing between three and four tons, and the quarters on four smaller bells. The wheels were of gun-metal; and each of the four dials was seven feet in diameter. The Exhibition also contained numerous other horological machines, among which we may mention a steam or speed clock, a chime-clock with fifty changes, silent clocks, cuckoo-clocks, a clock with a perpetual register of the day of the week and month, an astronomical clock impelled by gravitation, a regulator to be wound up once in twelve months, and a geographical clock showing the time throughout the world.

In various churches in England it has been found inconvenient to have the dial of the clock outside the

building, either because there has not been room enough for it, or because it would be a disfigurement to the architecture. In such cases striking clocks have been placed, which sound forth the hours and quarters, although not indicating them visibly. The only church-clock in London without a face is St. Vedast's, in Foster Lane, at the back of the Post Office. It strikes on a small shrill bell. Both Litchfield and Peterborough Cathedrals have these faceless clocks. There is now at Leeds Castle, Kent, a clock of the early part of the sixteenth century, which has the movement and striking-part complete, but no dial-works or face. A butcher-churchwarden of Doncaster ruined the grand old tower of the church there by placing a hideous clock-face in it, which was so constructed that no one could see the time by it except from the butcher's own door.

The wooden-clocks, commonly known as Dutch clocks, have been made for about two centuries. Before the cheap American clocks were introduced there was scarcely a middle-class and lower-class householder that did not possess a Dutch clock, which told the time in the kitchen or bedroom, where its painted face and cords and weights were mostly to be found, with tolerable accuracy. But we remember what Albert Smith said in his 'Christopher Tadpole' about this humble horologe: "The Dutch-clock pointed to twenty minutes to three and struck eleven—the combination signifying that it was eight precisely, after the dissolute manner of Dutch clocks in general." These clocks were first produced in Holland; but the greater number of them are now made on the confines of the Black Forest, in Germany. This Forest is the mountainous district, extending from the frontier of Switzerland northward along the Rhine, a distance of about one hundred miles. It

contains an abundance of wood, almost its sole production, which is exported in large quantities to England and Holland. The peasantry, an intelligent and frugal class, make good use of this natural produce, in the skilful manufacture of various useful and ornamental articles. But their greatest mechanical genius is expended upon their clocks. As a rule, these branches of industry are carried on in the homes of the people after the agricultural work is done. It is during the long winter evenings especially that they, both old and young, employ their time in these occupations. The labour is divided among the case-makers, the founders of the brass wheels and bells, the chain and chain-wheel makers, the painters and varnishers, and, lastly, the clockmakers, who put the works together and finish them. With the exception of the works, which are cast by the founder, and the painting of the dial, the whole of the clock is made by the members of one family. At an early age the children begin to carve the roughest woodwork, and advance through the other stages of the labour, until they become clockmakers and finishers. In and after the sixteenth century there was a gradually increasing demand for clocks in Germany; but they were too high in price to be generally used in the house, and for many years the makers endeavoured to produce a cheaper kind. In 1660 some intelligent wood carvers in the Black Forest succeeded in making clocks entirely of wood, which, although rough and simple, for the time supplied the want. But they showed only the hours, and would go only for half-a-day. There was no striking work, and the moving power was a balancing piece of wood with two movable weights. In 1740, instead of the balancing piece a pendulum was used as a motive principle, and the im-

provements in a short time made the clocks to go twenty-four hours, and strike the hours and quarters. Some also moved figures, indicating the day of the month, and the like. In 1750, the wooden works were replaced by metallic works, wheels, and chains. To meet the increasing competition which improved machinery caused in the clock trade, the Grand Duke Leopold, about 1847, founded the Clock and Watch Makers' School at Furtwangen, which is supported by the Government of Baden with a yearly contribution of 1,000*l*. The annual exports of clocks from the Grand Duchy of Baden alone, not including watches, amounts to one million pounds sterling.

In a building in Yarmouth up to the year 1861 was an ancient timepiece called the Dutch clock; the building in which it was placed having been used in the seventeenth century as a chapel for the Dutch refugees.

Apropos of our mention of Dutch clocks, we may add that clock-chimes or carillons were invented in the Low Countries, where they have been brought to the greatest perfection, and may be heard in every town. They are of two kinds, the one being attached to a cylinder, like the barrel of an organ, which always repeats the same tunes, and is moved by machinery; and the other being a superior kind, played by a musician with a set of keys. In all the great towns are amateurs or salaried professors, usually the organists of the churches, who perform with great skill upon this gigantic instrument, which is placed high up in the steeple. So fond are the Dutch and Belgians of this kind of music, that in some of their cities the chimes appear scarcely ever to be at rest, either by day or by night. The tunes are usually changed every year. Chimes were in existence at Bruges in 1300; therefore

the claim of Alost to the invention in 1487 is unfounded. The chimes from the Tour des Halles, Bruges, are to English ears most novel and pleasing, although not to be compared with the sprinkling shower of music which drops down from the high tower of Antwerp Cathedral every few minutes of the day and night. Longfellow thus wrote of the chimes of Bruges:—

"But amid my broken slumbers,
Still I heard those magic numbers,
As they loud proclaimed the flight
And stolen marches of the night;
Till their chimes in sweet collision
Mingled with each wandering vision,
Mingled with the fortune telling
Gipsy-bands of dreams and fancies,
Which amid the waste expanses
Of the silent land of trances
Have their solitary dwelling.

"Thus dreamed I, as by night I lay
Listening with a wild delight
To the chimes that, through the night,
Rang their changes from the belfry
Of that quaint old Flemish city."

The chimes of Antwerp Cathedral consist of nearly one hundred bells; and a singular feeling results from them when they play under the feet of a person on the summit of the tower (on which is the gigantic clockface). They throb through the very stones and frame of the building, and every nerve of the body.

Longfellow, in his exquisite prose poem, 'Hyperion,' gives the following solemnly impressive description of midnight bells in the quiet city of Heidelberg: "In conversation like this, the hours glided away, till at length, from the Giant's Tours, the castle-clock struck twelve, with a sound that seemed to come from the Middle Ages. Like watchmen from the belfries, the city

clocks answered it, one by one. Then distant and muffled sounds were heard. Inarticulate words seemed to blot the foggy air, as if written on wet paper. These were the bells of Handschuhsheim, and of other villages on the broad plain of the Rhine, and among the hills of the Odenwald,—mysterious sounds, that seemed not of this world."

The public clocks of Belgium strike the hour half-an-hour beforehand; thus at half-past eleven they strike twelve. We are at a loss to understand the meaning or utility of this arrangement.

Mr. Vulliamy says, "There are several public clocks in Flanders which have very large dials; but these only indicate the hours and the quarters by one hand, which makes a revolution in twelve hours: indeed, this was the only mode by which, until very recently, the time was shown by public clocks. These dials are not inaptly called skeleton dials, being composed of very light circles connected together by the figures and other divisions and slender bars traversing the centre, and are fixed in their places by fastenings not perceptible at a little distance. By this means the sight of the building is very little interrupted, or its general appearance disfigured. It must be borne in mind that when these buildings were erected clocks were almost unknown, and that not any provision being made for a dial, the general appearance is much disfigured by a large dial as commonly made. Of this there cannot be a more striking example than is exhibited by the clock-tower of Canterbury Cathedral, which is sadly disfigured by the clock-face. In modern buildings, when it is intended to place a clock, it is customary to provide for the dial. The largest skeleton dial in Flanders is the dial of the clock in the great tower of the Cathedral at Malines; it is

forty-two Flemish feet* in diameter, but from its great height, and the great size of the tower, the sides of which measure ninety feet at its base, it does not appear nearly so large." Mr. Vulliamy also adds: "I will here notice that the clocks in Belgium strike upon bells comparatively small. These circumstances very much diminish the difficulties attendant upon making a clock of this description; moreover, the performance of most of the Flemish clocks is such as would not be tolerated in the situation for which the clock for the new Palace (at Westminster) is required."

American clocks have found great favour with the public, and by reason of their portability and the neatness of their exterior have much superseded the old familiar Dutch clocks. They are of inferior workmanship, and lack altogether that finish of which the English workman is justly proud. America has organized a very extensive system of clock manufacture, which is carried out on the factory system, chiefly at Connecticut. At that place one clockmaking firm employs two hundred and fifty hands. Many of the operatives are boys and girls, and the products of their united labours are six hundred clocks a-day. 'Simmonds's Colonial Magazine' for 1845 contains an account of the clock-factory of Jerome, in the city of New Haven, then one of the most extensive establishments of the kind in the United States. The writer says: "We cannot describe minutely the whole process of making a clock, or the life-like movement of the machinery; it would take more time and space than we can at present devote to this purpose. In short, the case, movements, plates,

* A Flemish foot is equal to about 12·37 inches English measurement, which gives 43 English feet 2·7 inches for the diameter of the dial.

face, &c., which when put together, form one of Jerome's celebrated 'brass eight-day clocks,' go through some fifty different hands before completed. One man can put together about seventy-five movements per day, while every part, from the first process to the finishing, goes on with equal rapidity. We learn from him that the greatest bulk of clocks which he anticipates making this year are designed for European markets, and that he has already received orders from houses in London and Birmingham, England, a large house in Scotland, and also some quite extensive dealers in Canada. In fact, the Yankee clock is becoming a general favourite in England, almost entirely superseding the old Dutch clock, which has been long used there as a time-piece. He yearly consumes of the various articles used in the manufacture of clocks the following enormous quantities:—500,000 feet pine lumber; 200,000 feet mahogany and rosewood veneers; 200 tons of iron for weights; 100,000lbs. of brass; 300 casks of nails; 1,500 boxes of glass, 50 feet per box; 1,500 gallons varnish; 15,000lbs. wire; 10,000lbs. glue; 30,000 looking-glass plates. 2,400 dollars are paid yearly for printing labels, and for screws, saws, coal, and oil. Workmen employed, 75; paid wages yearly, 30,000 dollars; clocks made per day, 200; year, 50,000."

The wheels and plate-holes of American clocks are all stamped; in fact there is very little worth of manual labour in the whole of their movements. The pinions are all of a kind that are called lantern pinions, which have their leaves made of pieces of wire set round an axis in two collars. A traveller in the Mosquito territory in Central America, writing in 1856, of a visit paid by him to the negro king of the country, says that a Yankee clock was part of the furniture of his state

room. That which is accomplished in an American clock by a spring, the going, was in the tall old-fashioned eight-day clocks performed by the gradual fall of a heavy weight. While writing of these domestic clocks of our forefathers, we are reminded of the lines of Longfellow upon—

"THE OLD CLOCK ON THE STAIRS.

"Somewhat back from the village street
Stands the old-fashioned country seat.
Across its antique portico
Tall poplar-trees their shadows throw;
And from its station in the hall
An ancient timepiece says to all,—
'For ever—never!
Never—for ever!'

"Halfway up the stairs it stands,
And points and beckons with its hands
From its case of massive oak,
Like a monk who, under his cloak,
Crosses himself, and sighs, alas!
With sorrowful voice to all who pass,—
'For ever—never!
Never—for ever!'

"By day its voice is low and light;
But in the silent dead of night,
Distinct as a passing footstep's fall,
It echoes along the vacant hall,
Along the ceiling, along the floor,
And seems to say, at each chamber-door,—
'For ever—never;
Never—for ever!'

"Through days of sorrow and of mirth,
Through days of death and days of birth,
Through ever swift vicissitude
Of changeful time, unchanged it has stood,
And as if, like God, it all things saw,
It calmly repeats those words of awe,—
'For ever—never!
Never—for ever!'

"In that mansion used to be
Free-hearted hospitality;
His great fires up the chimney roared;
The stranger feasted at his board;
But, like the skeleton at the feast,
That warning timepiece never ceased,—
'For ever—never!
Never—for ever!'

"There groups of merry children played,
There youths and maidens dreaming strayed;
O precious hours! O golden prime,
And affluence of love and time!
Even as a miser counts his gold,
Those hours the ancient timepiece told,—
'For ever—never!
Never—for ever!'

"From that chamber, clothed in white,
The bride came forth on her wedding night;
There, in that silent room below,
The dead lay in his shroud of snow;
And in the hush that followed the prayer,
Was heard the old clock on the stair,—
'For ever—never!
Never—for ever!'

"All are scattered now and fled,
Some are married, some are dead;
And when I ask, with throbs of pain,
'Ah! when shall they all meet again?'
As in the days long since gone by,
The ancient timepiece makes reply,—
'For ever—never!
Never—for ever!'

"Never here, for ever there,
Where all parting, pain, and care,
And death and time shall disappear,—
For ever there, but never here!
The horologe of Eternity
Sayeth this incessantly,—
'For ever—never!
Never—for ever!'"

Longfellow puts as a motto to this poem the following extract from Jacques Bridaine:—"L'éternité est une pendule, dont le balancier dit et redit sans cesse ces deux mots seulement, dans le silence des tombeaux: 'Toujours! jamais! Jamais! toujours!'" There is no dead thing so like a living thing as a clock, which deliberately performs its appointed work both by day and by night, with scarcely any interruption during the lapses of many generations of men, reminding them that they are passing away, and of the period when "the great clock of Time will have run down for ever."

France is famous for highly ornamental table and mantelshelf clocks, the cases of which are mostly of more worth than the works. These articles have long formed an important feature in the decoration of rooms in French households. A French traveller, writing in 1809, tells us that luxury did not extend to the interior of the houses in Spain, for he saw there none of those glasses and clocks which embellished the apartments of his native country. A magazine writer, in 1856, referring to a Parisian home, says:—"The strange little rooms looked even stranger by day; nothing abounded but looking-glasses and clocks, which were hung on every vacant place."

The comparatively recent mission of the Earl of Elgin to China and Japan (1857–1859) has brought under the notice of Europeans the time-measurers in use among the people of the latter country. Mr. Oliphant, in his 'Narrative' of the mission says:—"When we got back into the business part of the town (Yedo), we stopped at a watchmaker's to buy jewellery and clocks . . . . The latter were of various descriptions, some constructed on European models, others

fashioned upon a principle peculiar to Japan, and supposed to be more convenient for the registration of the singular division of their time. The twenty-four hours are divided in Japan into twelve periods of time, six of which are appropriated to darkness, and six to the light. The day being calculated from sunrise to sunset, there is a necessary variation in the length of the six day and six night hours, the latter being the longest in winter, the former in summer. The clocks are altered periodically to suit the seasons of the year."

On a similar principle to that of the primitive clepsydra, or water-clock, is the atmospheric clock, an invention which was patented a few years ago; the main difference being in the density of the fluid used, mercury in the present machine being substituted for water. This clock is in appearance like a long thermometer, without the bulb of mercury at the bottom. It has a glass tube, about three-eighths of an inch in diameter, and the length of the thermometer-like frame; this tube is secured to the frame by two bands, through which the tube easily slides. Inside the glass tube is another and smaller tube, at each end of which is some mercury and a scrap of blotting paper, or other absorbent material, for the purpose of absorbing any damp which might find its way into the tube. About an inch and a-half from each end of the inner tube is a small throat, through which the mercury has to pass. On each side of the glass tube are the divisions of time. The mercury in the top end of the tube is placed opposite the mark of the proper time, and it descends to the bottom of the tube exactly as the time lapses. When the mercury has reached the bottom of the tube the frame can be turned, and the mercury set to the time on the other side; and so the time

may be continually indicated. This is a sort of perpetual hour-glass.

Some time since was exhibited at a watchmaker's window in Montgomery Street, San Francisco, a clock, the hand of which apparently could not be made to revolve, there being no visible means to make it do so. The dial was a simple plate of transparent glass, with a small, smooth pin in the centre, which passed through a plain hole in the hand, there being only one, an hour-hand, light and slender; and upon the short end of it was a small box of thin metal. There was no contact of the hand with the dial except at the pivot, and there was nothing touching the pivot except the hand and the glass in which it was fixed; yet the machine kept perfect time. This clock was a mechanical puzzle, and attracted a constant crowd round the window in which it was displayed. Probably the works were in the small box on the short end of the hand. Suppose within this box watchwork driven by a spring and regulated by a balance-wheel, so that it would cause a little hand to revolve once in twelve hours, in a plane parallel with the dial; then let this little hand carry a small weight, say a pistol bullet, on its end, and let the large hand be made very light and be so nicely poised that when the weight was furthest from the fulcrum, it would bring the short end of the large hand down, causing the long end to point directly upward and to indicate twelve o'clock; but when the weight was nearest the fulcrum the long hand would overbalance, and so point downward to six o'clock. Then as the weight revolved it would cause the hand to balance in the several positions around the dial, depending upon the time of day as kept by the watchwork within the box. If this

explanation be correct, the hand might be laid away in a drawer, and on taking it out at any time, and slipping it upon the pivot, it would swing to the exact hour of the day.

The total number of clocks imported to this country in 1865, to August 31st, was one hundred and forty-nine thousand nine hundred and sixteen, as against two hundred and twelve thousand three hundred and fifteen in 1864, and one hundred and ninety-six thousand and eighty-seven in 1863, corresponding periods.

The following proverbs and items of folk lore relate to clocks:—"Lovers ever run before the clock;" "The clock goes as it pleases the clerk;" "Whores and thieves go by the clock;" "A mill, a clock, and a woman always want mending;" "They agree like the clocks of London." This last proverb is found among both the French and Italian ones, for an instance of disagreement. There is a Somersetshire saying, that "A child born in chime-hours will have the power to see spirits." A Staffordshire proverb says, "You're too fast, like Walsall clock." It is said in Peterborough, that when the clock of the cathedral and the clock of the parish church strike simultaneously, there will be a death in the Minster Yard. This is fully believed by the old women of the city; although the saying probably arose from the noted irregularities of the two clocks. A writer in 'Notes and Queries' says:—"I knew an intelligent, well-informed gentleman in Scotland, who, among the last injunctions on his death-bed, ordered that as soon as he expired the house-clock was to be stopped, which was strictly obeyed. His reason for this I never could fathom, except that it was to impress upon his family the solemnity of the circumstance, and that with him time was no longer." The custom of

stopping clocks in a house wherein a corpse lies prevails in Germany. It is simply a manifestation of respect for the dead, and is designed to produce that complete silence which is supposed to be the most proper token of respect.

The clock of Trinity College, Dublin, is always kept a quarter of an hour slow, and all University examinations and proceedings are regulated by that time. A legend states that the College time was altered in consequence of a student being killed in endeavouring to cross the railings, having been too late for admission by the gate. A traveller about the year 1730 tells us that the clocks at Basil went an hour faster than in other places, which some derived from the discovery of a conspiracy, the measures whereof were defeated by the alteration of the clock. Others, from the time of the council held there, which after lasting seventeen years ended in 1448, as a contrivance that the holy fathers should rise an hour earlier, or sit at table an hour less, two o'clock being the time of the council's sitting.

Two persons belonging to a neighbouring town, being on a visit at Glasgow to see the lions, went to the College among other places. On looking up to the clock-dial they were astonished to observe only one hand, which was an hour behind. One of them thinking that nothing could be wrong about the College, observed in a flippant, apologetic tone, "Hoot man, that's naething ova; 'od, man, I've seen our toun clock aught days wrang." Yorkshire men always speak of a clock as "she."

Mr. J. C. Jeaffreson in his novel, 'Live it Down,' 1863, gives us the following legend about Blownorton clock:—"There was a pleasant fiction throughout the 'lights lands,' that certain inhabitants of the obscure parish of Blownorton had in their keeping a magnificent

eight-day clock, which they held on trust to present it to the first man in the 'light lands' who could prove that he habitually minded his own business, and never meddled intrusively with the affairs of his neighbours. There were many firm believers in the existence of this chronometer, though no one could name the eccentric philanthropist who in the mists of antiquity, had purchased and bequeathed it to the Blownorton trustees, for the purpose of inciting mankind to virtue and prudence. The fiction did not lose in humour from the fact that, at the close of the last century, Blownorton was described by a grave photographer of the 'light lands' as a decayed parish, containing only sixteen souls, since which time the said population of sixteen souls had so decreased from sickness, emigration, and the destruction by fire of its two last cottages, that it was generally held in popular imagination to have become an altogether uninhabited tract of thirsty sand,—whereon nothing was to be found save the aforementioned costly timepiece, which no one had ever proved himself worthy of possessing, and which could not any longer be disposed of according to the terms of the trust, as all the inhabitants of Blownorton had vanished: and no person or persons existed in all creation qualified to bestow the clock on any fit candidate who should lay claim to the prize. It is to be hoped that the Charitable Trust Commissioners have made enquiries concerning this clock. As gentlemen whose especial business it is to look into other people's business, the right of any one of the said Commissioners to take possession of the clock, in consideration of his own individual merits, would be an interesting subject for discussion."

Dr. Bigsby tells the author that he once saw at a

furniture broker's shop in the country a very old and curious looking timepiece exposed for sale. He asked the dealer if it were Dutch or English. "Oh, English," said the owner; "the maker's name is on the dial, and I have often seen clocks of his make." "What is the name?" asked the doctor. "Tummas Fudgit," was the reply. The doctor was puzzled at the moment, but on examining the dial, upon which certain words indistinctly appeared, engraved in very corroded steel, he read the often-repeated warning — "Tempus fugit," which the shopkeeper had so ridiculously misunderstood. This story reminds us of another one told of an auctioneer at Nottingham, who, enlarging upon the excellence of an engraving, said that nothing more need be added to show the value of the piece, than to mention that it was by that most eminent and well-known artist, Pinxit.

CHAPTER VII.

Invention of Watches — Etymology of the word Watch — Where Watches first made — Nuremberg Egg Watches — Watch alleged to have belonged to Robert Bruce, King of Scotland — Charles V. and his Watches — Watches in Rings — Paris Clockmakers obtain the Monopoly of making Watches — Watches introduced into England — First Lady who wore a Watch — Abbot Whiting's Watch — Early English Watches — Henry VIII.'s Watches — Edward VI.'s Watch — Princess Mary's Watches — Watches of Mary Queen of Scots — Death's Head or Skull-shaped Watches — Coffin-shaped Watch — Watch found at Winchester — Shapes and Construction of Early Watches — Striking Watches stolen from Charles V. and Louis XI. — Small Watches in Rings, Walking Sticks, and Boxes — Cruciform Watches — Crystal Watches — Sir Francis Drake's Astrolabe — Queen Elizabeth's numerous Watches — Duck-shaped Watch — Ester, the Watchmaker—Watch found at Delamere House, Cheshire — Watches in Dover Museum — Watches bequeathed by Wills — Allusions to Watches by Shakespeare, Ben Jonson, and Brome — Bewitched Watch — Sir Walter Raleigh's Watch.

How many of the folks who so often in the course of a day pull out their watches to see the hour give a thought to the history of those mechanical contrivances for measuring the flight of moments? Very few, we think. It is sufficient for most people if their watches keep correct time, and whatever historical interest may be appertaining to the little machines lies shut up and unobserved among the wheels and springs which the cases enclose. Let us take our timekeeper out of our pocket, and to the tune of its unceasing, nervous voice—like an audible theme—we will jot down some gathered notes from its scattered history, with the ambitious hope that he or she who may peruse our collectanæ and notanda may the more prize, for dear memory's sake, that large old-fashioned family silver watch, with the

ribbon and pinchbeck seals, which now lies neglected and almost forgotten in his or her relic-drawer; but which was a highly valued part of the personal effects of "grandfather" before he went into that land wherein time-measurers are not needed. Only a little stretch of imagination is required in order to give to the small admonitory moralist which lies on the table before us an articulate utterance, so pregnant is its "tick, tick," as if it were counting old grandsire Time's gains of golden moments into heaps one by one as each falls sounding into the past.

Watches, under which name we include chronometers, the highest forms of watches, are the concentrated results of the horological endeavours of many centuries; during which the sundial, the clepsydra or water-clock, the hour or sand-glass, the wheel-clock, and the watch were successively, and by advancing gradations of skill, constructed. The invention of the last-named instrument was the culminating point of horometry, and it was developed out of the increasing needs and experiences of mankind. It is almost surplusage for us to state that the watch of the present time, commodious as it is in shape and size, chaste in design and construction, and true to its purpose even to the beat of a pulse, did not arrive at this perfection at once. A volume might be written about the steps of the delicate art which in due order shaped and applied the coiled spring, the spiral balance spring, the repeating movement, the varied escapements, the jewelled pivots, and all the other mechanisms that are now combined in a good watch—an instrument which, although it is so small that it may be hidden from view in a lady's hand, represents the consolidated genius of the horologists of four centuries.

The word watch is derived from the Saxon *wæcca*, from *wæcan*, *wæccan*, to wake; the Swedish *vacht* or *vakt*, watch, guard; *vachta*, to watch; and the Danish *vagt*. The name watch was applied to pocket clocks, because they were instruments by which the progress of time could be watched or noticed.

The first step towards watch-making was the invention of a coiled spring as the motive power in lieu of a weight, the source of motion in clocks. It is obvious that a watch cannot have either weights or a pendulum, because if it had either it would have to be kept upright; it therefore has for a motion the expansive force of a spring, and for a regulating power a balance wheel, which is provided with a spiral spring, and performs the same office as gravity does in instruments that have a pendulum. The invention of the coiled spring as a going power appears to have been made in the last quarter of the fifteenth century; but by whom and where are uncertain. The ancient German city of Nuremberg, famous for its ingenious artizans, has always claimed the invention of pocket clocks, as watches were first named; and the fact that they were in early times called Nuremberg eggs, from their oval-shape, and that this town stood pre-eminent for the number and quality of its watches, seems to favour and almost justify the claim, which reaches back to the year 1477. But the same honour has been appropriated by the town of Blois, in France, upon less plausible grounds. And even China is said to have introduced the invention into Germany, whence it passed to France, and so into England. Peter Hele, a clever mechanician, of Nuremberg, who died in 1540, so early as 1490 made small watches of steel which moved without weights, pointed out and struck the hours, and might be worn on the person.

Cocclæus, a contemporary writer, in 1511 describes Hele's "parva horologia," which could be carried about "etiam in sinu marsupiove." The dates given are no doubt approximately correct, because Gaspar Visconti, a noble Milanese poet, alludes to watches in a sonnet written by him in 1494, which purports to have been composed by a person in love, who, comparing himself to one of these instruments, refers to a hidden power working within his heart both by day and by night. It would therefore seem that watches had by that time found their way into Italy, a country which has, indeed, claimed for itself the invention of them. Thus Dominico Maria Manni says that a Florentine astronomer, named Lorenzo di Vulparia, was the first contriver of them.

In the last century a neatly arranged fraud on the subject of the period of the invention of watches deceived many antiquaries. The story runs that some labourers being employed at Bruce Castle, in Fifeshire, found there a watch, which they disposed of to a shopkeeper at St. Andrew's, who sent it to his brother in London, from whom it passed into the possession of George III. A letter in the 'Gentleman's Magazine,' dated Forfar, August 20th, 1785, and signed J. Jamieson, says that the watch was offered for sale to the writer by a goldsmith hawker of Glasgow, who afterwards sold it for two guineas; and it was next sold for five. The letter does not trace the course of the article further; but Adam Thompson, in his 'Time and Timekeepers,' says that it subsequently found its way into the museum of George III. The outer case of this watch was of silver, with a handsome raised pattern over a ground of blue enamel, and the ciphers R. B. very indistinct at each corner of the chased work. Upon the dial-plate

were engraved the deceptive words, "Robertus B. Rex Scottorum;" and over it was a thin convex transparent horn covering instead of a glass. Altogether the watch was a little larger than those now in common use. Many persons readily assumed that it had belonged to Robert Bruce, King of Scotland, who died in 1328, a date far before that generally assigned to the invention of the art of watchmaking. But the inscription was undoubtedly one of those historical forgeries which now and again crop up for the confusion of antiquaries, and are as perplexing to them as the discovery of new historical truths that upset old settled conclusions.

Assuming that watches were invented in 1477, we find them in a few years so far developed that they described seconds of time, and were used in 1500 for the purpose of taking astronomical observations by George Purbach, a mathematician of Vienna. And if some writers could be believed, watches actually became the objects of a collector's mania and pet hobby soon afterwards. For instance, the Emperor Charles V., who had a watch, or as some have called it a small table-clock, in 1530, on his retirement subsequently into the monastery of St. Juste or Yuste, under the influence of a religious monomania, used to sit after dinner with several on the table before him, his bottle being in the centre; and endeavour to amuse his dejected mind by trying to make his portable clocks accord—a vain task, as he found, and productive only of a salutary moral reflection in his brain, which shaped itself into the following pithy words:—"What an egregious fool must I have been to have squandered so much blood and treasure in an absurd attempt to make all men think alike, when I cannot even make a few watches keep time together!" We are also told,

that while the Emperor was one day attentively examining his time-keepers, a careless monk, upon entering the apartment abruptly, overthrew them. Although this unfortunate accident did much damage, which was in that day difficult to be set right, the Emperor was so little disconcerted, that he pleasantly said to the abashed cleric who had done the mischief, "I have been labouring for some time to make these clocks go together, and now you have accomplished it in an instant." Voltaire adduces the Emperor's fondness for clocks and watches as a proof of his insanity. But without doubt the stories about Charles's horological freaks are mere historical traditions, which Robertson and subsequent writers have repeated; and with these legends has been coupled the erroneous statement that Torriano, who had the title of "Watchmaker to the Emperor," worked with his master at the trade. The truth is that Charles V. had a great natural taste for the exact sciences, which is proved by the variety of mathematical instruments that are enumerated in the inventory of his effects, taken after his death. Torriano, far from being a mere clockmaker, was a first-rate engineer and mathematician, and was called by the historian Strada the Archimedes of his age. His mechanical inventions gained him a reputation for sorcery among the monks of St. Juste. With regard to the reputed collection of clocks, mention is made of only four or five in the long inventory above named. The Emperor was a very exact observer of time; but no contemporary writer has authorized us to suppose that he took especial pleasure in collecting a variety of timepieces. We may safely conjecture that the art of watchmaking made rapid progress soon after the time of its invention, because this Emperor

had, according to Powell's 'Humane Industry,' 1661, a watch, which necessarily must have been very small, "made in the collet or jewel of a ring; and King James had the like." The application of timekeeping-mechanisms to articles of personal ornament was then not uncommon, as we shall have occasion to show presently.

As further evidence of the quick advancement of the watchmaker's profession, we find that in 1544 the Guild of Master Clockmakers in Paris obtained a statute from Francis I., which secured to them the exclusive privilege of making or causing to be made clocks and watches, both large and small, within the precincts of that city.

Recorded history varies in the date when watches were, as a continental invention, introduced into England; some authors giving it so early as the year 1557; others, among whom is Hume, in 1577; and others so late as 1597. Clearly the true time was much before the first-named year, and early in the reign of Henry VIII. Sir Thomas Chamberlayne, of Prestbury, in Gloucestershire, who was ambassador from England to the Courts of Charles V., Philip II. of Spain, and the King of Sweden, and was born in the time of Edward IV., and died in that of Elizabeth at an advanced age, is credited with having brought to this country from Nassau, a lady of which place he married, the first watches and the first coaches that were seen here. Folks who are curious, and withal credulous on this point, may see in one of the halls at Oxford the figure of a female who is said to have been the first wearer of a watch. Inasmuch as Fitz-Allan, Earl of Arundel, is also said to have introduced coaches into England, where they were first made in 1555, it remains doubtful whether Chamberlayne is deserving of the credit which

has been given to him in relation to those vehicles, and perhaps to watches as well.

Warner, in his 'History of Glastonbury,' gives us an account and an engraving of Abbot Whiting's watch, which is thick and octagon-shaped. On the inside of the cover of the face is engraved, "Richard Whytinge, 1536." In 1826, it belonged to the Rev. John Bowen, of Portland Place, Bath, vicar of Mudford, Somerset. In 1783, Mr. Bowen, being then vicar of Bishops Lydeard, Somerset, purchased it of Mr. Howe, a watchmaker, who had bought it some time before at a sale by auction of the goods of the Rev. Mr. Paine, then deceased, who had lived to the advanced age of one hundred years. In the family of this gentleman a tradition was preserved that the watch had been successively worn by himself, his father, and his grandfather, and that it had been purchased by an ancestor of the latter at the sale of Abbot Whiting's personal property after his execution and the dissolution of his monastery. Mr. Bowen presented it to his wife, who descended in a right line from Mr. John Jeanes, the husband of Elizabeth, one of the two sisters of Whiting, about the beginning of the sixteenth century. The 'Gentleman's Magazine' for 1805 states that the watch was then in the Rev John Bowen's possession. It passed from him or his wife to the late Duke of Sussex (who was the greatest collector of curious timepieces in this country), at the sale of whose effects, in 1843, it was purchased by the late Charles Kirkpatrick Sharpe, the author of many contributions to Sir Walter Scott's 'Minstrelsy of the Scottish Border,' and who is familiar to all readers of Lockhart's life of the great novelist. Mr. Sharpe bequeathed the watch to the late Duke of Sutherland.

Count Charles Edward Stuart D'Albanie has a silver-gilt watch of English workmanship, and dated 1539; and also another of similar metal, which formerly belonged to a Duke of Ferrara. In Sir Ashton Lever's Museum was a watch bearing the date 1541.

Henry VIII. had a watch that went for a week, and was in going order so late as 1696, when Derham published his 'Artificial Clockmaker.' This monarch seems to have had a great *penchant* for clocks and watches, and also to have expended considerable sums of money out of his private purse in the purchase and repair of these costly pieces of mechanism. In his 'Privy Purse Expenses,' edited by Sir Harris Nicolas,* occur numerous items of payments for them; and although "clokkes" only are referred to in these accounts, it is certain that from the descriptions given of them, in some instances watches were meant. Thus we find 10*l.* 10*s.*, a large amount in those days, paid for a clock in a case of gold, which no doubt was one that we should now call a watch. Mr. C. Copland exhibited, in the Great Exhibition of 1851, a watch that was said to have been the property of Henry VIII.

By a 'Royal Household Book' of the time of Henry VIII. and Edward VI.,† it appears that the latter sovereign had at his palace at Westminster in 1542, "oone larum or watch of iron, the case being likewise iron gilt, with two plumettes of led." This description may throw some light on the origin of the term watch, which is usually applied to small portable machines that do not sound the hours; while the name clock has been given to those instruments which strike upon a bell. The former word, which in the passage given above seems to be for the first time used, appears to be syno-

* *Vide* page 57, *ante*. † *Vide* page 59, *ante*.

nymous with alarum, denoting a machine by which not only could the progress of time be watched, but which also aroused to vigilance.

The Princess Mary, afterwards Queen of England, gave some employment to the horologists of her day; as we find in her privy-purse expenses sundry disbursements to them. Sixty shillings were paid by her to one Bastion for making a new clock, and twenty shillings for mending four clocks; and she appears to have had a watch which gave her some trouble, as the sum of 7*s.* 6*d.* was "paid to the clockmaker for mending my lady's clock at sundry times." By the word clock was meant doubtless a time-keeping machine for the pocket, otherwise a watch.

In early times a morbid taste influenced the shapes of watches, which not infrequently were made in the forms of skulls and coffins. When the famous Diana of Poitiers became the mistress of Henry II. of France she was a widow, and the court out of compliment to her adopted the most ghastly fancies for articles of personal decoration, and among them were watches in the lugubrious shapes before mentioned. Although a skeleton's head may be a severe satire upon the great littleness of mortality, we doubt whether a mimic skull worn upon the body became a moral agent. It does not appear that "the horrible conceit of death," as evidenced in these fanciful watches, long remained in fashion. Probably the court grew tired of the "decent horror" of a *mode* which reminded them of the grave.

In the possession of Sir John Dick Lauder, Bart., of the Grange House, near Edinburgh, and Fountain Hall, Haddington, is a most curious and interesting death's head or skull-shaped watch, which formerly belonged to Mary, Queen of Scots, and was bequeathed by her

to her maid-of-honour, Mary Setoun, on February 7th, 1587. It afterwards came into the possession of Sir Thomas Dick Lauder, the father of the present owner. This antique watch is of silver gilt; and on the forehead of the skull is the figure of Death, with his scythe and sand-glass; he stands between a palace on the one hand and a cottage on the other, with his toes applied equally to the door of each; and around him is a passage from Horace: "Pallida mors æquo pulsat pede pauperum tabernas regumque turres." On the posterior part of the skull is a representation of Time devouring all things. He also has a scythe, and near him is a serpent with its tail in its mouth, as an emblem of eternity. This is surrounded by another motto from Horace: "Tempus edax rerum tuque invidiosa vetustas." The upper part of the skull is divided into two compartments, on one of which are represented our first parents in the garden of Eden, attended by some animals, with the motto, "Peccando perditionem miseriam æternam posteris mernere." In the other is depicted the Crucifixion of Christ, who is represented as suffering between the two thieves, while the Maries are adorating below. The legend to this is, "Sic justitiæ satis fecit mortem superavit, salutem comparavit." Running below these compartments on both sides is open work of about an inch in width, to permit the sound to issue freely when the watch strikes. This pierced work consists of emblems of the Passion and Crucifixion of Christ, such as the cross, swords, pincers, lantern used in the garden, spears, one with a sponge on its point, scourges flagon and cup of the Eucharist, coat without a seam, dice thrown for it, hammer, nails, thongs, ladder, and crown of thorns. Under all these is the motto, "Scala cæli ad gloriamvia." The watch is opened by reversing

the skull, and placing the upper part of it in the hollow of the hand, and then lifting the under-jaw, which rises on a hinge. Inside, on the plate or lid, is a representation of the Holy Family in the stable at Bethlehem, with the infant Jesus in the manger, and angels ministering to him. In the upper part an angel is descending with a scroll, on which is written, "Gloria excelsis Deo, et in terra pax, hominibus bona volu." In the distance are the shepherds with their flocks, and one of the men is in the act of performing on a cornemuse. The works of this watch are as brains in the skull; the dial-plate being on a flat where the roof of the mouth is to be found in a human being. It is of silver, and is fixed within a golden circle, richly carved in a scroll pattern. The hours are marked in large Roman letters, and within them is the figure of Saturn devouring his children, with this legend round the outer rim of the flat: "Sicut meis sic et omnibus idem." The works are entire, in perfect order, and perform astonishingly well. A silver bell of very musical sound fills the entire hollow of the skull, and contains the movements within it when the watch is shut. A small hammer, set in motion by a separate escapement, strikes the hours on it. The watch requires to be wound up every twenty-six hours, in order to keep it going with tolerable accuracy. The place of the chain, which is a modern addition, was originally supplied by a catgut cord, according to the old fashion. There is no date upon the watch, but the maker's name appears, "Moyse, Blois," to which place Mary went with her husband, the dauphin of France, before his death. This singular relic, although it has a chain attached to the top of the skull, is much too heavy to be carried about the person. Probably it was intended to occupy a stationary place on a *prie-dieu*,

or private altar, in a small oratory. A drawing of it is among the collections of the Society of Antiquaries of London, and it is engraved in Smith's 'Historical and Literary Curiosities.'

Another skull-watch which once belonged to Mary, Queen of Scots, who had numerous watches if tradition may be believed, is in existence. Upon it the arms of France and Scotland are engraved in separate shields on each side of the jaws. An inscription—"Ex dono Fr. R. Fr. ad. Mariam Reg. Scotorvm et Fr." together with the date 1560, shows that Francis II. of France presented it to his young wife many years before watches were supposed to have been brought to England from Germany.

At the Monastery of Klosterneuberg, near Vienna, is a death's head of precious metal, containing a tiny watch.

The elder Mr. Roskell, an eminent goldsmith of Liverpool, who collected specimens of ancient watch-work, and put them into going order, had another of these *memento mori* watches, in the shape of a small death's head of silver, with a ring in the summit of the skull, for suspending the article to the girdle. The lower jaw opened so that the dial might be examined. The same gentleman had also a watch which was said to have belonged to one of the pilgrim fathers, and perhaps was an appendage to an emigrant in the 'Mayflower.' It was found in the backwoods of America. Mr. Roskell, in addition, possessed a watch of most elaborate workmanship, having three massive cases all in gold, each case being highly embellished with chasing and figures in relievo, the outer case having been originally studded with large diamonds round the rim, but of late years deficient.

A memorial watch, having its movements enclosed in a case of transparent crystal, shaped like a coffin, and formerly belonging to Mary, Queen of Scots, is now in the possession of Sir Peter Murray Threipland, Baronet.

A large oval watch which was once owned by the same hapless lady was exhibited to the Philosophical Society of Edinburgh in the year 1850, previously to its being finally deposited in the museum of the Andersonian University. It is alleged to have been found immediately after the queen's escape from her imprisonment in Lochleven Castle. It has a mixed metal case like of a hunting watch, and of considerably greater size than those of the present day. The dial-plate is elaborately engraved with the representation of some continental city. The interior has a cord of catgut instead of a chain. The watch, which bears the maker's name, F. Le Grande, is still in good order; and before the time of its deposit in the museum above named it had long been in the possession of an antiquary residing near Edinburgh.

Queen Mary, while she was a prisoner in Fotheringay Castle, just before her execution, made a present of her watch to the governor of the castle as a token of gratitude for his civil treatment of her. He is said to have been an ancestor of the Earls Fitzwilliam. The watch passed into the possession of so many different persons, that ultimately the one who had it was scarcely known; until towards the end of the last century Lady Godolphin was the owner of it, and she restored it to the family that originally possessed it, for she stood sponsor to the son and heir of a Lord Fitzwilliam, and made the infant a gift of the watch.

The same queen gave a watch to John Knox, the

Reformer, who died on November 24th, 1572. Agnes Strickland in her 'Life of Mary Stuart,' writing of a meeting between the queen and the great divine, says:—"It is supposed to have been at this interview that Mary, as a pledge of amity, presented to Knox a small watch in a crystal case, of an oblong octagon shape, which when his biographer, the late Dr. M'Crie, wrote his celebrated work, was in the possession of Mr. Thompson of Aberdeen. Another of Queen Mary's watches, of French workmanship, is in possession of the Rev. Mr. Torrance, minister of Glencross, which together with an elegant little jewel, called a solitaire, were given or bequeathed by Mary the night before her execution to a French lady of the name of Massie, the ancestress of the late possessor, Dr. Scott. The watch itself is small and circular, in a black shagreen case, studded with gold stars, with a central cross formed of fleurs-de-lys. The dial-plate is of white enamel, somewhat larger than a shilling, with antique Roman figures in black. The maker's name is Etienne Hubert, of Rouen. A thread of catgut supplies the place of the chain used in the works of modern watches. The catgut is not found in watches later than those of the sixteenth century."

Dr. M'Crie, writing in 1818, tells the story of Knox's watch as follows:—"Mr. Thomson, of Banchory, possesses from his ancestors an antique watch; and the tradition in the family is that this watch belonged to the Reformer, and was presented to him by Queen Mary at a time when she was anxious to cajole him into an approbation of her measures. . . . . It is of an octagonal, oblong shape, an inch-and-a-half in length, and one-and-two-tenths in breadth. It has two cases or lids, which are concave silver plates, each

opening by itself on a brass hinge. Under the upper lid is the brass front of the watch, with a small silver dial-plate in the middle. The dial-plate is only nine-tenths of an inch in diameter, and circular. The hours are in Roman numerals around its edge, and there is a great deal of minute carving, both within and without the dial-plate. Under the other case, or back of the watch, are carved on the brass-plate these words, 'N. Forsaict a Paris.' The interior appears to be disposed nearly in the same mode as in modern watches. It has a crown escapement. Instead of the chain of the fusee, there is a fine therm band. The balance-wheel has no spring."

Professor Leslie, of Edinburgh, writing to Dr. M'Crie in 1813, expressed his opinion that this watch was of the period to which it was alleged that it belonged; and he adds:—"I have had the opportunity of inspecting an antique watch, through the politeness of Mr. J. Scot, late chemist in Edinburgh, the lineal descendant of a Frenchman of the name of Massie, who having attended Queen Mary into Scotland, had received the relic from his mistress. It is a small round old watch, scarcely exceeding an inch in diameter, and made by Hubert in Rouen. It is precisely of the same structure, but without carving or other ornament, as the one with which that artful princess is said to have endeavoured to bribe our stern reformer."

In the 'Gentleman's Magazine' for 1803 is an engraving of the curiously sculptured upper valve of the silver case of a watch, which had then lately been found in a field near Winchester. The maker's name and place of abode, "Edmund Bull in Fleestreet fecit," were engraved in a neat Italian hand on the back of the works. The shape of the watch was octangular; and its size was not more than one inch-and-a-half in

length, by an inch-and-one-eighth in breadth, and about half-an-inch in depth. The workmanship was delicate and beautiful. In the central compartment of the upper valve was engraved the story of the Immaculate Conception of the Virgin Mary by the Holy Ghost; on the left of which was the figure of St. Peter, and in another compartment on the opposite side that of St. Paul, with the sword of his martyrdom lying by his side. The other compartments were filled with angels, priests, and flowers. The opposite valve or back of the case was equally elegant and handsome, being adorned with sculpture, the central compartment of which represented the miracle of St. Peter healing the lame beggar in the beautiful gate of the Temple. On the left side in a similar compartment was St. Jude; and on the right St. James, whose name underneath in French, "Sint Jaq.," seemed to show that the work was by a foreign artist. In the rest of the smaller compartments were seen angels with fruits and flowers. The device of two roses springing from one stem, as well as the conjunction of the rose and thistle, seemed to have reference to Mary, Queen of Scots. On the dial-plate was engraved in a spirited manner the Ascension of Christ, with the globe under his feet, and a group of spectators beneath looking upwards with astonishment. The case was made to open on both sides. There was neither minute-hand, spring pendulum, or chain; catgut being used instead of the latter. The pendant was somewhat in the shape of a fleur-de-lis.

At whatever time watches were introduced into England, it seems that they did not come into general use here until the reign of Queen Elizabeth; and then only among the more wealthy and fashionable members of society, by whom alone these costly and novel arti-

cles of personal use and adornment could be afforded. The Fellows of colleges and other learned men in the age of Elizabeth contented themselves with carrying sand-glasses in their hands. This appears from Aubrey's amusing 'Memoirs;' and a tragical misadventure, in which a portable sand-glass makes a very prominent figure, is related in the manuscript diary of the Rev. James Melville, to have happened in 1589 at St. Andrew's; where an assault was made by one of the partisans of Archbishop Adamson, on William Wallwood, Professor of Laws, who "going from his house in the town to the colledge, his gown on, his book in the one hand and sand-glass in the other, meditating on his lesson, Henery Hamilton issues out of a house where he lay in wait for blood, and on besetting Mr. William, with the first stroke wounds him in the hand and mutilats." This occasioned a riot, in which one person lost his life. In Savile's account of one of the state Progresses of James I. to Theobald's, in 1603, he tells us that he stopped at the Bell Inn, at Edmonton, to see the show, and requiring to count how many vehicles should pass the house within a given time, he "called for an houreglasse," which he obtained. We read that in 1623 a preacher was "attended by a man that brought after him his book and hour-glass." These facts plainly tell us that the newly-imported watch had not then commonly superseded the old simple sand-glass.

Early watches were of such rich design, and so much more highly decorated than our present ones, that they were worn as much for ornament as convenience. Some were of elaborate pierced-work, and others were studded with precious stones, or highly finished with pictures in enamel both on the inner and

on the outer cases. The shapes of the watches introduced about this period were very varied; for example, some were oval, and were called Nuremberg eggs; others retaining the oblong shape were octangular; while others were round, cruciform, skull, acorn, pear, melon, tulip, and purse-shaped. They also took other whimsical forms, as we shall have occasion to show in order of date presently. However, they shortly afterwards appeared in a more convenient design, namely, that of the round but thick and heavy pocket clocks of the seventeenth and eighteenth centuries.

The early watches were constructed without glasses, the cases opening at the back and front, and being generally engraved with mythological or allegorical subjects, and sometimes, although rarely, with portraits. The bow was a swivel, so that it might be easily turned whilst hanging at the girdle, for the wearer to examine the dial. Most of these watches had bells, on which the hours of the day and night were struck; and instances are recorded in which such audible instruments were stolen from Charles V. and Louis XI., and the thief in each case was detected by the watch proclaiming at once the hour and the crime. The circumstance of the culprit's detection by the tongue of time is said to have so much amused Louis, that he forgave the thief, and made him a present of the watch. The cases of these striking watches were pierced with the most elaborate ornamental openwork for the emission of the sound; and they had also pierced metal covers to the faces before glasses were introduced; the perforations, corresponding with the number of the hours engraved on the dial, were just large enough to permit the point of the hour-hand to be seen. The wheels of early watches were small, and their

diameter was usually about one-fourth that of the plate, when the watch was round. After the application of the pendulum spring, their size was in many instances greatly enlarged; and they sometimes covered three-fourths of the plate. They are now usually made about one-half of the diameter of the plate, or a trifle less. The works of the earliest clocks and watches were made entirely of iron and steel, brass being used for the pillars and plates of the latter before the invention of the fusee; but the wheels still continued to be made of steel for some time longer. During the second quarter of the sixteenth century, however, brass was used for them, and has been so used until the present time.

The first constructed watches were generally large in size, and fully warranted their appellation of pocket clocks; but after the invention of the fusee, to obviate the inconveniences arising from the varying power of the main spring, early in the sixteenth century, watchmakers soon made watches of a much smaller and more portable form. The striking and alarum machinery, and the heavy bell, were often dispensed with; and the simple going movement was made very small, and finished off with great care. Our readers will remember that Charles V. had a watch inserted in his ring. This adaptation of horology to articles of ornament for the person was then not uncommon, by reason of the diminutiveness of the works which could be constructed to keep time. They were set in the heads of walking-sticks, the clasps of bracelets, or worn as rings or pendants, and enriched with the most costly jewels. Sometimes these Lilliputian specimens were enclosed in cases of crystal, so that their works might be seen in action. Andreas Heinlein, of Nuremberg,

was famous for the manufacture of little watches, which as a novelty he introduced into musk or perfume boxes. The Duke of Urbino is said to have been offered a striking-watch mounted in a ring, by an Italian goldsmith, in the year 1542.

Archbishop Parker by his will, which is written in Latin, and bears date April 5th, 1575, makes the following bequest to the Bishop of Ely:—"I give to my reverend brother Richard, Bishop of Ely, my stick of Indian cane which hath a watch in the top of it." Pancirollus informs us that about the end of the fifteenth century watches were made no larger than an almond, by a man named Mermecide. The Rev. Mark Noble describes an ancient Dutch watch which he possessed when a schoolboy, and which he pulled to pieces in order to make the wheels into whirligigs. He says, "It was very small, and in silver cases, with a catgut string instead of a chain; and it required to be wound up every twelve hours." At a meeting of the Archæological Institute, held on January 7th, 1859, Mr. Franks exhibited a very diminutive watch in the form of the flower of the fritillary, with the maker's name engraved upon the works inside, "Edward Bysse fecit." It had formerly been in the Bernal Collection.

Our readers may see in the South Kensington Museum three watches of an early period, which are most interesting as displaying the progress of the art within a century of its invention. One is contained in an agate case, mounted in enamelled gold; the dial, of the same metal, being enriched with arabesques in champ-levé enamel, and set with rubies. The height of this watch is one inch and three quarters, and its width one inch and a quarter. It is of Italian workmanship, and was purchased at the Bernal sale for

15*l.* 10*s.* The second is in the form of a cross, and in a rock-crystal, metal mounted case. At the top is a group of minute figures, apparently Diana and Endymion. The height of this watch is three inches and a quarter, and its width one inch and a half. The maker's initials are N.K. It also was purchased at the Bernal sale for 13*l.* 10*s.* The third article at the museum named is a watch-case in bronze gilt, with perforated arabesque ornamentation. It is of Italian, and probably Venetian work, about the year 1550. It was formerly in the Soulages Collection.

Before the Society of Antiquaries in the year 1850 was exhibited a very elegant gilt metal watch in the form of a pectoral cross, called by the French a *montre d'abbesse*, and probably made for some lady superior of a convent. On the cover of the face the design, wrought in relief, represented in the centre the Crucifixion, with the figures of the Virgin and St. John standing on either side, whilst at the extremities and arms of the cross were angels and cherubs. On the back in the centre was the figure of the Virgin with the Child surrounded by angels. On either side and beneath her were three other figures; and above her head was an aged man, probably intended for the Father. Around the sides of the watch were engraved various emblems of the Passion. The face was gilt, and also engraved with a figure of the Virgin and Child; the hours, to which a hand of blue steel pointed, were marked on a circle of silver. The works were neatly arranged in the form of a cross, and bore the insription, "Finelly à Aix." The original case, also shaped like a cross, and ornamented with silver studs, remains in the possession of Mr. O. Morgan, who considers this crucifix watch to have been made about the year 1560.

At a meeting of the Archæological Institute, held on June 1st, 1849, Mr. Morgan exhibited an interesting watch, which was probably made in England early in the reign of Elizabeth, and was ornamented with a Tudor rose. The maker's name was Ferdinando Garret. A similar watch, of about the year 1560, appears to have been in the possession of the Riddell family. Mr. Morgan on the same occasion also produced several English watches of the close of the sixteenth century, one of them having been made by John Limpard; several elegant ladies' watches of the same period, formed of rock-crystal, set in silver; and a very interesting golden egg or acorn shaped watch, made by Hans John of Königsberg, having the earliest specimen of a chain instead of a catgut, and curiously contrived with a small wheel-lock pistol, which was perhaps intended to serve as an alarum at a certain hour. This article was of the seventeenth century. At a meeting of the same Institute, held on December 3rd, 1852, Mr. Morgan exhibited a cruciform watch of the close of the sixteenth century; and on June 3rd, 1853, he produced to the members a watch which was made at Autun about 1560–80. At a meeting of the same Institute, held on February 3rd, 1855, Captain Oakes exhibited a small watch of the sixteenth century, in the form of a shell; it bore the maker's name, "Tho. Reeue In Popes head Aley," and the initials E. P. On May 6th, 1864, the Hon. Mrs. Arbuthnot exhibited a silver case in the form of a bird bearing a Cupid, and containing a watch of English workmanship.

Mr. H. Munster has a round watch of turquoise enamel, with a crown set with rubies, emeralds, and diamonds, and the diamond letters E. R. The bow, hasp, and hinge are also set with diamonds. On the

dial-plate, which is likewise enamelled, are the letters E. I. F. and A.D. 1562. The maker was Bouguet, of London.

In the Painted Hall at Greenwich Hospital is the astrolabe, or instrument for taking the altitude of the sun and stars, that once belonged to Sir Francis Drake. It was constructed for him when he was Captain Drake, prior to his first expedition to the West Indies in 1570; and it subsequently belonged to the Stanhope family. In 1783 it was presented by Philip, fifth Earl of Chesterfield, on his quitting England as ambassador to Spain, to the Rev. Thomas Bigsby, M.A., of Stanton Manor, Derbyshire, who had in the preceding year married Frances Stanhope, his lordship's stepmother. In 1812 that gentleman, in anticipation of approaching death, gave it to his younger brother, Robert Bigsby, Esq., of Sion Hill House, Nottinghamshire, in whose possession it remained until his death in 1825. It then came into the hands of his son, Dr. Robert Bigsby, by whom it was presented to William IV. in April, 1831. That King bestowed it upon the Royal Hospital at Greenwich. A particular description of this astrolabe appears in the 'Literary Gazette' for June 10th, 1837; and an engraving of it, showing the portion of its interior in which the sundial is introduced, may be seen in the 'Illustrated London News' for June 14th, 1856. Dr. Robert Bigsby's poem, 'The Triumph of Drake, or, The Dawn of England's Naval Power,' 1840, contains the following stanza descriptive of the astrolabe:—

"Within its brief and crowded space, were curiously comprised
Each instrument and table, for the mariner's use devised:
There was the quadrant's skill disclosed, and there the compass told
Where dwelt the still presiding North, when ambient billows rolled;

Solar and lunar almanacks their blended lore supplied—
The latitudes and longitudes were aptly graved beside:
And there the well-known sundial its oft-used scheme displayed,
More prized, in less inventive days, ere watches lent their aid!"

Nichols, in his 'Progresses of Queen Elizabeth,' mentions various watches that were presented to that queen, and in which the combinations of precious metals and stones and watchwork were very novel and interesting. The Earl of Leicester, Master of the Horse, gave to his royal mistress as a new year's gift in the fourteenth year of her reign, 1571–2, "one armlet or shakell of golde, all over fairely garnishedd with rubyes and dyamondes, haveing in the closing thearof a clocke." In the same year another gift is thus described:—"Item, a juell, being a chrsolite garnished with golde, flagon facyon, thone side sett with two emeraldes, ... thother side having in it a clocke." In the sixteenth year of her reign Elizabeth received as a new year's gift from Margaret, Countess of Derby, "A white beare of gold and mother of perle, holding a ragged staffe, standing upon a tonne of golde, whearin is a clocke, the same tonne-staffe garnished with dyamondes and rubyes." The "clocke and all" weighed three ounces. It should be remembered that Leicester's device was a bear and ragged staff. In the eighteenth year Mr. Hatton, Captain of the Guard, gave the queen "A riche juell, being a clocke of golde, garnished with dyamondes, rubyes, emeraldes, and perles, with one very fayre rubye in the bottome, and a fayre emeralde pendante sett in golde, and two mene perles pendaunte, all ix oz. iii q^{a}." In the twenty-first year the Earl of Leicester presented Elizabeth with "A tablet of golde, being a clocke fully furnished with small diamondes and rubyes; abowte the same are six bigger diamondes

pointed, and a pendaunte of golde, diamondes, and rubyes very smale. And upon eche side a losengye diamonde, and an apple of golde enamuled greene and russet." In the same year the Earl of Russell gave to the queen, "A ring of golde, called a paramadas, sett with vj small diamonds, and garnished round about with small rubies and two sparcks of ophalls, and in the same backeside a dyall." In the twenty-third year of her reign, 1580–1, the Earl of Leicester gave her "A cheyne of golde made like a payre of beades, contayning viii long peeces fully garnished with small diamondes, and fower score and one smaller peeces, fullie garnished with like diamondes; and hanging thereat a rounde clocke fullie garnished with dyamondes, and an appendante of diamondes hanging thearat." In the same year was presented to the queen by Lord Russell, "Item, a watche sett in mother of pearle, with three pendaunts of goulde garnished with sparckes of rubyes, and an ophall in everie of them, and three small pearles pendaunte." In the same year Mr. Edward Stafford gave her majesty, "A little clocke of goulde with a cristall, garnished with sparkes of small dyamondes, sparkes of rubyes, and sparkes of emeraldes, and furnished on the back syde with other dyamondes, rubies, and other stones of small value." In the twenty-ninth year of her reign Thomas Knevett gave the queen "A smale clocke, the case golde enamuled, with a smale perle."

The following is an inventory of the many horological machines which belonged to Queen Elizabeth; and although we find the word clock often used in it, we may nevertheless conclude from the context that the word watch was in most instances meant:—

"Item, a watche of golde sett with small rubies,

small diamondes, and small emerodes, with a pearle in the toppe called a buckett, wantinge two rubies.

" Item, a clocke of golde conteyninge in the border four table diamondes and two very small rocke rubies, havinge on th'one side foure table rubies and sixe small diamondes; and on thother side eleven table diamondes, whereof the one is more bigger then the residue. On the one side a man sitting aslepe with a childe before him.

" Item, a clocke or tablett of golde garnished on th'one side with five faire diamondes and one faier rubie; and on th'other side five faier rubies and one faier emerod garnished with lij litle diamondes, and liij litle rubies, with a pearle pendant at it.

" Item, one clocke of golde curiously wrought and fullie furnished with diamondes, rubies, emerodes, and opalls, havinge in the middes thereof a beare and a ragged staffe of sparkes of diamondes and rubies.

" Item, one clock of gold curiously wrought with flowers and beastes, with a queene on the toppe on th'one side; and on the other side a beare and a ragged staff of sparkes of diamonds, fullie furnished with diamonds and rubies of sundry sortes and bignes; one emerode under it, a faier table diamond with a ragged staff in the foyle thereof, and a faier rubie under it squared; and a pearle pendaunt on either side of the clocke.

" Item, one clocke of golde wrought like deysès and paunseyes, garnished with little sparkes of diamonds, rubies, and emerodes, and eight small pearles on the border, and a pendant acorne.

" Item, one clocke of gold curiously wrought with small sparkes of stones, having on th'one side a horse bearing a globe with a crowne over it.

"Item, one clocke of golde with a George on both sides, garnished with sparkes of diamondes and a pendant of opalls.

"Item, a litle watche of christall slightly garnished with golde.

"Item, one litle clocke of golde, th'one side being agate with a mouse on the toppe and heddes round about it.

"Item, one litle watche of golde garnished on the border with very small sparkes of rubies and emerodes with christall on both sides, and a pearle pendant garnished with golde like a flesh flye.

"Item, one rounde clocke of golde enameled with a man on horsebacke, and divers colors aboute it.

"Item, a watche of golde garnished with three small diamondes and eight sparkes of rubies, with a very little pearle.

"Item, one litle clocke of golde enameled of the History of Time.

"Item, a litle watche of golde, th'one side with a frogge on the topp, th'other side garnished with small garnets like a pomegranate.

"Item, one litle clocke sett in eliotropie and garnished with golde.

"Item, a litle watche of golde enameled with sundry colors on both sides alike.

"Item, a litle watche of christall slightlie garnished with golde, with her Ma'ties picture in it.

"Item, one diall of christall slightly garnished with golde.

"Item, one faier flower of golde fully garnished with rubies and diamondes enameled on the backside with a man and a scripture aboute him, having a watch in it and a pearl pendant.

"Item, one flower of golde fully garnished with emerods of sondrie bignes, and sparkes of emerods and rubies, with three antique women and five litle perles with a watch or clocke therein.

"Item, a watch of agatte made like an egg garnished with golde.

"Item, one clocke garnished with golde, beinge round and sett with 6 table diamondes and 6 rubies in the same border, and garnished with xvij diamondes on th'one side and 8 diamonds and one rubie on th'other side lacking two pearles.

"Item, an hower glass sett in golde with 6 emerods, 3 turquesses, two rubies, and xv small diamondes with 6 perles."

In the library of the Royal Institution is a watch that is reputed to have belonged to Queen Elizabeth. The works are enclosed in crystal, set in gold, which together with the dial is elegantly enamelled. In the Ashmolean Museum at Oxford is a circular watch, which is said to have been worn by the same queen; but, as in many other instances, this "is said" is undoubtedly a fiction, because the watch bears the name of Edward East as maker, and he was a famous horologist in the time of Charles I., several years later than the period of Elizabeth.* The article in question is one that we should now call a hunting-watch; it is of gold, shaped like a melon, studded with large and fine turquoises, and having a gold chain formed of lockets, with braids of hair and other mementos.

At a meeting of the British Archæological Association, held on June 13th, 1864, Mr. Luxmore exhibited a lady's watch, which was made at the close of Elizabeth's reign, and worthy of having been her property.

* *Vide* page 274.

It was one inch and three-sixteenths in diameter, and rather under three-quarters in thickness. The gold case was set with two hundred turquoises arranged in eight concentric circles, with a single one in the middle. In the centre of the gold face was a Tudor rose of crimson and green translucid enamel, and on the margin were crimson and blue leaves, and fruit of the same material. The hours, in Roman numerals, were of black enamel; no minutes were indicated; and the barbed hand was of steel. The plates, wheels, and pillars were of brass; and the axes and balance-wheel of steel, the latter being protected by a foliated gilt cock. It had a catgut cord instead of the more modern chain. On this costly trinket was engraved the maker's name, J. H. Ester, who appears to have been one of eminence in his trade, as a pear-shaped watch of parcel-gilt silver, also made by him, was in the Bernal Collection; and Lady Sophia des Vœux has a small gold jewelled and enamelled watch, of which he was the maker. The case is set with four large cut garnets, bordered with white enamel. The collets are of diamonds. Inside the cover is inlaid with an enamelled bird. Ester seems to have had a relative in the same art as himself, for Lady Fellows has a gold tulip-shaped watch, with three crystal faces, silver rims, and engraved silver dials, of about the same age as the foregoing, inscribed Henry Ester; and in the South Kensington Museum is a silver watch in the form of a duck, two inches and five-eighths long, bearing the same name. He is said to have been a German artist. Lady O. Fitzgerald has a watch in the form of a duck, the feathers of which are chased on the silver. The lower part opens, and the dial-plate, which is likewise of silver, is enriched with a gilt ornamented design of floriated scrolls and angels' heads.

The wheelwork is on small rubies. This article is believed to be of the time of Elizabeth. Lady Fitzgerald has also a watch which was formerly in the Bernal Collection, and represents the classic story of Jupiter and Ganemede. The works are contained in the body of an eagle, which opens across the centre, and displays the dial-plate, richly engraved with scrolls and flowers on a ground of niello. This watch is so constructed that when not suspended to the girdle by a ring in the centre of the bird's beak, it can stand on the claws wherever it may be placed.

In the City of London Library at Guildhall is a watch of the time of Elizabeth. It is of gilt metal, oblong in shape and six-sided. The face is protected by a perforated plate in lieu of a glass.

Lady Fellows has a circular gilt pedestal alarum-watch, with a dial on the top, but the bell is wanting. Inside are the initials H. S. T. A., and the date 1581. Also a large oval metal watch, engraved with female figures of Justice and Charity. It has an engraved dial, and a coat-of-arms inside the cover. The maker was Ghylis Van Gheele, and the date is 1589. Also a round gilt pedestal alarum-watch, engraved with flowers, and the bell falling over the dial-plate. It is of the sixteenth century. Also a circular steel watch-case of the same date, with a chased pattern of circles, a rosette in the centre, and an engraved brass hinge and hasp.

At a meeting of the Archæological Institute, held on November 5th, 1852, Mr. G. F. Wilbraham exhibited an oval-shaped striking-watch, of about the year 1600, with a curiously engraved dial, showing the movements of the stars, and a perpetual almanac. It was made by Gribelin, at Blois, and was found in Delamere House, Cheshire. In the South Kensington Museum is another

oval engraved watch, inscribed Gribelin, Blois, and of the year 1614. Its size is three inches by one inch and three-quarters. It was purchased for the Museum for 3*l.* 10*s.* In the same collection is a tulip-watch in an oviform case of rock-crystal, mounted in silver and gilt bronze; it is of French make, about the year 1600, and is marked "Senebier." Its height is one inch and three-quarters, and its width one inch and a quarter. It was purchased for 15*l.* In the same museum is a watch of French manufacture, in an engraved silver case, and of the same date. Also an octangular watch-case in gilt bronze, with a perforated dial in silver, decorated with flowers and birds, in translucent champ-levé enamel. It has a crystal cover, and is of German make, about the year 1600. Its height is three inches, and its width two inches and three-eighths. It was purchased for 4*l.* In the British Museum is a very thick English watch, which was made by H. Roberts, about the same year, and presented to the nation by Mr. Felix Slade. The face is elaborate in the information that it gives, and is unprotected by a glass. There is in existence a watch of the end of the sixteenth or beginning of the seventeenth century, oval in shape, the case being of silver with gold edges, opening on both sides, and containing a sundial and a magnetic needle. The works are removable from the case, into which they are fixed by a pair of springs. The main-spring of the watch is wound up by catgut. The case and dial-plate are beautifully engraved with martial emblems upon rich filigree-work, in the style of the designs of the famous Theodore De Bry, who engraved and furnished to the French gold and silver smiths and watchmakers many patterns for their works at the latter part of the sixteenth and the commencement of the seventeenth centuries. The maker

of this watch was "J. Barberet à Paris." Lady Fitzgerald has a cruciform watch, covered with elaborate engraving of a very delicate character. The centre of the dial-plate represents Christ's agony in the Garden of Olives, the outer compartments being occupied by the emblems of the Passion. A figure of Faith fills the lowermost. The style of engraving is very like that of De Bry, before mentioned.

In the museum at Dover are two watches of about the same date. One is of silver, double-cased, of an oval shape like the Nuremberg egg-watches, and has two movable dials, one of which has the numerals of the month and other numerals on it, and near the centre are the signs of the zodiac. The fixed part round which it revolves has the names of the months abbreviated. The other dial has merely the hours upon it. There is also a revolving-plate much below the surface with the days of the week upon it. Another aperture shows the day of the month; another, the moon's position, described by a small etched moon on a plate; and the other shows the month. Inside the maker's name is engraved, "John Burgis fecit;" but there is no date. The works move in the opposite direction to those used in the present system of watch-making. This watch was presented to the museum by Captain Eaton. The other watch is a round one, in a stamped gilt metal case. It has two narrow revolving circles of the circumference of the watch itself. The outer one has the day of the month, and the inner one has the hours upon it. The centre of the watch is occupied by a figure of Time, who has in one hand a scythe, the blade of which is on the ground; and with the other hand he points to the hour. The maker's name is engraved inside, "Samuel Betts, London."

This watch was presented to the museum by a resident watchmaker, Mr. Mummery. In both specimens catgut is used instead of a chain, and each one is in fair working order.

There can be no doubt that watches were at first imported articles in England, and that shortly afterwards the artists who were employed in constructing them in this country were almost exclusively foreigners, who found the trade to be a lucrative occupation. It is a noticeable fact that no wills of watchmakers are found proved in the reign of Elizabeth and the commencement of that of James I., and mention of watches in wills is rare in these periods. We have before referred to the gift of a watch by the will of Archbishop Parker, dated in 1575,* which is one of the earliest of such testamentary dispositions of these portable timekeepers. And our readers will remember that Bartholomew Newsam, Queen Elizabeth's clockmaker, by his will, dated in 1586, gave "unto John Hill Esquire one cristall jewell with a watche in it, garnished with goulde;" also to his "very loveinge friende Mr. Barnarde Dewhurst one watch, gylte to shewe the hower; and to Albane Stepneth Esquire a strickinge clocke in a silken purse."† Anne, Duchess of Somerset, by her will dated July 14th, 1586, gave to her daughter-in-law, Lady Katherine Gray, a clock of gold, worth about 30*l.*; but no doubt this article was in fact a watch. Thomas Humminges, a citizen and barber-surgeon of London, by his will, proved in 1608, bequeathed to his "Sister Johns my brasse watch gilded within with gold, and a case to it gilded likewise." Philip Skippon, by his will, proved in 1660, bequeathed his "great silver watch with the clock and the silver chain thereat."

* *Vide* page 247. † *Vide* page 74.

Decker in his 'Gull's Hornbook,' 1609, gives advice to fops idling in St. Paul's Cathedral, as follows:— "Besides, you may here have fit occasion to discover your watch by taking it forth, and setting the wheels to the time of Paul's; which, I assure you, goes truer by five notes than S. Sepulchre's chimes. The benefit that will arise from hence is this, that you publish your charge in maintaining a gilded clock; and withal the world shall know that you are a time-pleaser." This passage clearly shows us that watches were, early in the seventeenth century, regarded as articles of interest and fashion, and that they retained the name of clocks, their first designation. They were not very general until several years after Decker wrote his tract.

Allusions to watches are not infrequent in the writings of our early dramatists. Shakespeare often mentions them. Thus, in 'Twelfth Night,' vain Malvolio, anticipating his contemplated but illusory grandeur, says, "I frown the while, and perchance wind up my watch, or play with some rich jewel." And in another scene the priest exclaims, "My watch hath told me, toward my grave I have travell'd but two hours." In the 'Tempest' Sebastian says, "Look! he's winding up the watch of his wit, by-and-by it will strike." And in the second part of 'King Henry IV.,' that sovereign, in his mournful soliloquy upon sleep, complains that the dull god "leav'st the kingly couch a watch-case, or a common 'larum bell." Ben Jonson, in his comedy of 'The Staple of Newes,' first acted in 1625, makes an extravagant heir draw forth a repeating-watch, which he sets on a table, and then waits with restless anxiety the arrival of his majority—

"'t strikes! one, two,
Three, four, five, six. Inough, inough, deare watch,

Thy pulse hath beate inough. Now sleepe and rest;
Would thou couldst make the time to doe so too:
I'll wind thee up no more. The houre is come
So long expected."

Jonson, in his 'Alchemist,' tells us of the loan of a watch for a particular occasion:—

"I had lent my watch last night for one
That dines to-day at the sheriff's."

In Brome's comedy of 'The Antipodes,' 1638, a character declares with regret, that

"every clerk can carry
The time of day in his pocket."

On which account a projector in the same play proposes to remedy the grievance by a "project against the multiplicity of pocket-watches."

George Wither, writing early in the seventeenth century, refers to "some jewel watch, whose case, set with diamonds, seems to grace," &c.

The wearing of a watch in the olden times was considered to be a mark of gentility, as we gather from the above extracts; and it was even worn ostentatiously hung round the neck by a chain, a fashion which has of late years been revived among ladies, but which was then common to the other sex. In an old play entitled 'A Mad World this, my Masters,' the custom is thus alluded to:—"Ah! by my troth, sir, besides a jewel and a jewel's fellow, a good fair watch that hung about my neck."

A story is related by Aubrey of one Allen, an alleged sorcerer, who died at the age of ninety-six in 1630, which tends to show that watches in his day were rather uncommon in country places. "One time being at Home Lacy, in Herefordshire, he happened to leave his

watch in the chamber-window — (watches were then rarities) — the maydes came in to make the bed, and hearing a thing in a case cry tick, tick, tick, presently concluded that that was his devill (or familiar), and took it by the string with the tongues (tongs), and threw it out of the windowe into the mote (to drowne the devill). It so happened that the string hung on a sprig of a elder that grew out of the mote; and this confirmed them that 'twas the devill. So the good old gentleman gott his watch again."

At a meeting of the Society of Antiquaries of Scotland, held on March 26th, 1851, was exhibited a curious collection of watches, including one which had belonged to Sir Walter Raleigh, and one to Drummond, the poet, of Hawthornden; besides several of a considerably earlier date. They were deposited in the society's museum; and on April 11th, in the same year, they formed the subject of an address by Alexander Bryson, F.S.A. Scot., to the society. At a meeting of the same association, held on June 14th, 1852, Mr. Robert Caunter exhibited an antique silver watch, with a separate index of the hours and minutes.

CHAPTER VIII.

Guido Fawkes's Watch — James I.'s Watches — Sir William Howard's Watch — Prince Henry's Watches — David Ramsey — James I. sends a Watch to his Sons — Small Watch like a Tulip — The Jesuit and his Watch — Milton's Watch — Watch Seals — Clockmakers' Company — Hollar's Representations of Watches — Watch found at Lord Torphichen's Seat — Portrait Watches — Charles I.'s Watches — Henrietta Maria's Gift of a Watch — Van Tromp's Watch — Oliver Cromwell's Watches — Charles II.'s Watches — Pepys and Lord Brounker's Watch — Watch Key given by Charles II. — Enamelled Watches — Watch Enamellers — Jacinth Watch — Richly Ornamented Watches — Durability of Watches — Novel Trial about a Watch — Advertisements about Lost Watches — Dr. Taswell's Watch — Watch found at Chislehurst — Nautilus-shaped Watch — Invention of the Spiral Spring — Dr. Hooke — Thomas Tompion — Daniel Quare — Edward Barlow — Repeating-Watches — James II.'s Watch — The Anchor Escapement — Touch Watches for the Blind — Law relating to Watches — Simon de Charmes.

In the third year of the reign of James I. a watch was found upon Guido Fawkes, which he and Percy had bought the day before, "to try conclusions for the long and short burning of the touchwood which he had prepared to give fire to the train of powder."

A watch that once belonged to James I., and was formerly in the collection of Sir Ashton Lever, and was purchased at the sale of his museum in 1806, was exhibited and described by Mr. H. Syer Cumming at a meeting of the Archæological Institute, on May 9th, 1855. It is of an oval shape, and measures, without its case, one inch and seven-eighths in length, one inch and three-eighths in width, and five-eighths of an inch in thickness. It is of French manufacture, and is nearly all of brass. The dial is

a silver ring one-eighth of an inch wide. The hours are engraved in Roman numerals, with a little stud at the base of each, by means of which the time could be ascertained in the dark by the touch. The steel hand is in the form of a dart. Above the dial is engraved a figure of Leda and the Swan; and below, a cherub's head, on each side of which is a fox; and the space between the devices is filled with rich foliage in scrolls. Within the circle of the dial is a view of a river, with swans, a bridge, and beyond it horses, trees, fields, hills, and a stag-hunt. On the plate at the back is engraved, "R. Dieu, à Paris." The cock which covers the balance-wheel is of rich design. Instead of a chain, this watch has a line of catgut; it has no hair-spring; neither are any screws used in its construction, which circumstances prove its early date.

There is another curious watch of this period still extant. It has a silver case, richly ornamented with subjects from mythology, beautifully chased. It bears the following inscription on the inner rim:—"From Alethea, Covntess of Arvndel, for her deare son, Sir William Howard, K.B., 1629." It is of oval form, two inches and a-half in diameter, and one inch and a-half in thickness. It strikes the hours, has an alarum, shows the days of the week, the age and phases of the moon, the days and months of the year, and the zodiac. On the inside is a Roman Catholic calendar, with the date 1613, and the maker's name, "P. Combret, à Lyons." In the South Kensington Museum is a silver watch shaped like a pecten shell; the dial being chased and engraved with scroll-work. The maker's name is "Pierre Combret à Lyon." The length is two inches and one-eighth, and the width one inch and three-quarters. It was purchased for 8*l.* 10*s.*

At a meeting of the Archæological Institute, held on December 7th, 1849, Mr. Frederick Ouvry exhibited a curious watch, which was supposed to have belonged to James I., or to have been a present from him. It was in shape like an egg flattened. It had an outer case of plain silver. The inner case was beautifully engraved, on one side representing Christ healing a cripple, with the motto used by King James, "Beati pacifici," and the royal arms underneath. On the other side, the Good Samaritan, with the inscription, "S. Lucas, c. 10." Inside the lid was a well-executed engraving of James I., with his style and title. Round the rim were the rose, the harp, and the thistle, all crowned with the initials "J. R." The face had a calendar, and showed the moon's age and other things. On the works was the maker's name, "David Ramsay Scotus me fecit." Underneath a small shield, which concealed the hole for winding, was the name of the engraver, "Gerhart de Heck sculps." It was the property of Miss Boulby, of Durham. It had long been in her family, and was supposed to have come to them from the Russells, of Woburn. The artist Heck mentioned above is not named by Walpole, nor in Bryan's 'Dictionary.' He was possibly of the same family as Nicholas Vander Heck, a painter at the Hague, about 1600, or John Vanden Hecke, who was settled at Antwerp, about 1650. One of the watches which had belonged to James I., was sold at the Duke of Sussex's sale.

In "The Accompte of the Money Expended by Sir David Murray, K^t, as Keaper of the Privie Purse to the late Noble Prynce Henry, Prynce of Wales, from the first of October, 1610, to the sixth of November, 1612 (the daye of the decease of the said Prynce) as

lykewise for certaine paymentes made after the deathe of the said Prynce in the monethes of November and December, 1612," in the Audit Office, Somerset House, is the following entry:—"Watches three bought of Mr. Ramsay the Clockmaker, lxj li." (61*l.*) In the list of 'Guyftes and Rewardes,' in the same account we find to "Mr. Ramsey the Clockemaker, xj *s.*" The money of the reigns of Elizabeth and James is valued at five times its present value.

The Ramsey named above was David or Davie Ramsey, the friend of Master Heriot, Gingling Geordie, and an eminent artificer in the time of James I. and Charles I. He was the first Master of the Clockmakers' Company on their incorporation in the seventh year of the reign of Charles I., 1631. An engraved portrait of George Heriot, jeweller to King James, who died in 1623, aged sixty-three, was published in 1743; the painter being Scougal, and the engraver Joc. Esplens.

On April 18th, 1623, James I. wrote from Windsor a letter to his "sweete boyes," who were then in Spain; and therewith sent certain jewels for their companion, the Duke of Buckingham, to give away. One jewel was, according to a contemporary inventory, "a clocke of goulde, garnisht on the one side with letters of dyamondes: Dieu et mon droyte; and on the other side, a cross of dyamondes fullie garnisht, with a pendante of dyamondes." The king in his letter said "the watche is the richest and fittest for some olde ladie in my opinion." With this royal opinion before us, we are induced to consider whether his majesty thought that a timekeeper was better suited to an elderly lady because of her nearness to the grave; or that the favour and influence of an aged woman, as against those of a young one, were more worth a costly

trinket; or that youthful beauty did not require a blaze of diamonds to enhance its attractions. Later we find a warrant of indemnity to the Lord High Treasurer for having delivered certain jewels to James I. that were sent into Spain as above mentioned, dated July 7th, 1623; in which document the "clocke of gould" is named.

In the 'Mirror' for 1836 is an engraving of a pretty, little, ancient watch, which was of silver, and about the size of a large walnut, and might be closed by the fingers in the palm of the hand without being seen. It was shaped like a tulip, the outer case being divided into three equal compartments, ornamented with a sort of leaf on a roughly-chased groundwork, and looking as unlike a watch as it possibly could. These leaves opened a little at the bottom of the watch, and disclosed a small spring, which, on being pressed, pushed up the lid and displayed the dial-plate, contained within a circular border; the space between which and the outer oval boundary of the face was filled by ornamental flower-work. In the centre of the dial-plate, within the figures, the rose and thistle were entwined, which would seem to fix the date of the construction of the watch to the reign of James I. Watches were worn at this period hung round the neck by a chain, and the silver one used for this purpose was still remaining attached to the above article.

In an engraved portrait of Marcus Antonius de Dominis, Archiepiscopus Spalatensis, aged fifty-seven in 1617, appears a watch of curious pattern and antique construction, placed on the table before him, with the lid open, showing the dial. This prelate came into England in the reign of James I., where he published his book 'De Republicâ Ecclesiasticâ,' a portion of

which he is represented in the act of writing in the engraving.

Gee, in his 'Foot out of the Snare,' published in 1624, says:—"If about Bloomesbury or Holborne thou meet a good smug fellow in a gold-laced suit, a cloak lined thorow with velvet, one that hath good store of coin in his purse, rings on his fingers, a watch in his pocket, which he will valew at above twenty pounds, a very broad-laced band, a stiletto by his side, a man at his heels, willing (upon small acquaintance) to intrude himself into thy company, and still desiring further to insinuate with thee; then take heed of a Jesuite of the prouder sort of priests."

In the South Kensington Museum is a metal gilt watch, the dial-plate of which is engraved with the Entombment of Christ, after Lucas van Leyden. The maker was "Nicholas Lemandre, à Blois, 1630." The length is five inches and one-eighth, and the width four inches and one-eighth. This watch was sold at the Bernal sale for 10*l.*

In the British Museum is a watch which belonged to Milton. It was made by William Bunting, in Pope's Head Alley, Cornhill, whose name appears in the tables of the Clockmakers' Company for that period. The face is inscribed "Ioanni Miltoni, 1631;" it shows the days of the month, and the hours, and has a glass. This watch was bequeathed to the nation by Sir Charles Fellowes, who had one of the finest collections of watches in England. It is said that a poor family in Yorkshire received a box from America as part of the effects of an aged relative, whose ancestors had emigrated to that continent soon after the time of the Commonwealth. The box contained several coins and the last-mentioned watch; and the family to whom the bequest came being

poor, sold the whole to a silversmith, who was also a watchmaker. The purchaser gave the full price for the coins, but refused to give more for the watch than the value of the silver case, 2*s.* 9*d.* The works, with the face on, which looked like iron, being so much tarnished, were put away in a drawer which was frequently opened. The friction after a time showed the face or dial to be of silver, with an inscription on it. This on being deciphered, after cleaning, was found to be as above given.

In 1634 was published the 'Translation of Ariosto,' by Sir John Harington, the poet, who died early in the seventeenth century. An engraving of Harington is given on the title-page, in which picture a watch is represented on a table. In Harington's 'Orlando Furioso,' 1591, the author is depicted with an article that appears to be a watch, on which is inscribed "Il tempo passa."

Probably watch-seals came into use shortly after watches became generally used. At a meeting of the British Archæological Association, held on June 8th, 1864, the Rev. E. Kell, F.S.A., exhibited a watch-seal of brass, of the first half of the seventeenth century, which was found in digging in a garden in Grosvenor Square, Southampton. The face was incised with a round shield charged with the letters J. H. H., ensigned by a coronet, and flanked by laurel branches.

The English watchmakers had by the reign of Charles I. risen to such importance, that in the year 1631 they gained a charter of incorporation under the name of the Master, Wardens, and Fellowship of the Art of Clockmaking of the City of London, and by which charter all foreign clocks, watches, and alarums were forbidden to be brought into the country. David Ramsey, who

had been clockmaker to James I., was, as we have before stated, appointed the first Master; and watches made by him, and by Edward East, David Bouquet, John Midnall (about 1650), Robert Grinkin (who made the watch attributed to Cromwell, in the British Museum), Benjamin Hill, and other early members of the company, are still extant. Some of their watches are round, and others oval, for the latter form continued to be occasionally employed until towards the close of the seventeenth century. The journals of the Company show that in 1635 a brass watch was of the value of forty shillings, and in the following year another watch was of the value of 4*l.* Respecting the early prices of watches little is known; but in 1643, 4*l.* were paid to redeem a watch taken from a nobleman killed in battle.

In Hollar's interesting set of plates of the 'Four Seasons,' dated 1641, the lady representing Summer has an egg-shaped watch on her left side, depending from her girdle. And Mr. Whelan had a small silver watch of the same form, and but little subsequent in date. The dial was engraved on a flat plate of silver; it had Roman numerals, with a stud at the base of each; and the steel hand terminated in a fleur-de-lis. On the plate at the back was engraved the maker's name, "Phillipe Grebay à Londres," which told that it was the work of a Frenchman. Probably the works had been renewed at a comparatively late period, for a chain took the place of the more primitive catgut. The cover was provided with a stout concavo-convex glass, set in a steel rim, and held in its place by three studs. The keyhole was protected by a crescent-formed plate moving on a pivot. At a meeting of the British Archæological Association, held on March 26th, 1856, Dr. W. V. Pettigrew exhibited an oval silver watch of

about the middle of the seventeenth century, very similar to the one belonging to Mr. Whelan, and described above, and which also was exhibited to the same Association in 1855. Within the circle of Roman numerals was engraved a view with a pedlar and dog crossing a bridge; and outside the circle the plate was adorned with rich foliage in niello work. The interior of the watch was well finished, but catgut was used instead of a chain. On the back plate was inscribed the maker's name and address, "Hans Conrad Elchinger fec. Amsterdam."

At a meeting of the Archæological Institute, held on April 13th, 1855, Mr. O. Morgan exhibited a gold enamelled hunting-watch, of about 1630 or 1640. The four subjects on the front, back, and inner side of the lid and case, represented the chief incidents in the Episode of Tancredi and Clorinda, in the 'Gierusalemme Liberata' of Tasso. At a meeting of the same Institute, held on February 6th, 1863, Lord Torphichen exhibited a curious clock-watch, striking the hours, and of skilful construction, with the name of the maker, Samuel Aspinwall, engraved upon the works. It had then lately been found at Lord Torphichen's seat, Calder House, Mid Calder, with other objects of value, in an old cabinet, which had not been opened for nearly a century. The outer case of the watch was of steel, wrought in openwork studded with silver; the inner case was of silver, likewise of openwork, and among the ornamental details were an eagle, a rose, and a lily. The dial was of silver beautifully engraved, the subject being the Accusation of Susannah by the Elders. There was only an hour-hand; the hours were struck on a fine-toned bell, serving as an inner case within the pierced work. The watch measured about

two-and-a-half inches in diameter, by one inch in thickness. There were two seals appended, one of steel, the other of jasper, engraved with the armorial bearings of the Torphichen family. The date of this watch was about 1650 or 1660. The silver pierced work of floral designs was much in vogue in the time of Charles I. It had a hair-spring and regulator, also a very fine chain, which might have been added in place of the original catgut about 1675. The name of Samuel Aspinwall is uncommon, but in 1675 Josiah Aspinwall was admitted a brother of the Clockmakers' Company.

In the South Kensington Museum is a gold enamelled watch, with the subjects of the Holy Family, after Rubens, and the Virgin and Child, after Mignard, on the exterior. The inner sides of the case contain respectively portraits of Louis XIII. and of Cardinal Richelieu. It is of French work, about 1640–50. The diameter is two inches and a quarter. It was purchased for 20*l*. At a meeting of the Society of Antiquaries of London, held on June 5th, 1862, Mr. Frederick Ouvry exhibited two watches bearing portraits and arms. These watches were the work of a Frenchman named Vernis Martin, of the time of Louis Quinze.

Lady Fitzgerald possesses a gold enamelled watch, manufactured by order of Louis XIII. as a present to our Charles I., which may rival a modern work for its smallness. It is oval, measuring about two inches by one inch and a half across the face, and is an inch in thickness. The back is chased in high relief with the figure of St. George and the Dragon. The motto of the garter surrounds the case, which is enriched with enamel colours.

A silver alarum clock-watch of circular form, which belonged to Charles I., and was usually placed by him

at his bedside, is now in the possession of Mr. W. Townley Mitford. It was presented by the king to his faithful and attached servant, Mr., afterwards Sir, Thomas Herbert, on his way to execution at Whitehall, on January 30th, 1649. "It came into possession of my family," says Mr. Mitford, "by intermarriage with the Herberts, about a century ago. Since that time it has remained in our possession." Parts of the interior mechanism of the watch were modernised about fifty years ago, and the original catgut cord was replaced by a metal one. The outer case of fine perforated work, enclosing two silver bells, on which the hours and quarters are struck, remains unaltered. "Edward East, London," is engraved inside. His name is among those of the ten assistants of the Clockmakers' Company on its first incorporation in 1631; and he gave by deed of settlement, dated June 20th, 1693, the sum of 100*l.* to the Company, in trust to pay annually to five poor labouring workmen of the art or mystery of clockmaking, who were freemen of the City of London, or to the widow of each of such workmen the sum of twenty shillings. Lady Fellows has an octangular crystal-cased watch, with an engraved dial of a recumbent female figure holding an hour-glass. The maker was Edward East. Another watch by the same maker belongs to Mr. W. A. Sanford. It is of silver, in the form of a cross, and has a crystal face, the dial being engraved with the Crucifixion and angels. It has a plain outer case of the same form. He is mentioned as the king's watchmaker, living in Fleet Street, in the 'Memoirs of the two last Years of the Reign of that unparalleled Prince, of ever blessed memory, King Charles I.,' by Sir Thomas Herbert, 1702. These memoirs contain a very particular account of the various

articles presented by Charles just previous to his decapitation, and also many allusions to the relic now possessed by Mr. Mitford. It appears that the King had two watches, one of gold and the other of silver, which he customarily wound up before going to bed; and they were placed before a lamp on a stool near his bedside. On the morning of his execution, as he went from his palace, he bade Sir Thomas Herbert bring him the silver clock that hung by the bedside. In the park he asked him what the time was, and then, taking the watch in his own hand, he gave it to Herbert, and told him to keep it in memory of him. This watch, which is beautifully chased and engraved, is about three inches in diameter, and about one inch and a quarter in thickness. The back and front of it are engraved in the 'Sussex Archæological Collections,' vol. iii. p. 103; and in the 'Archæological Journal' for 1850. The gold watch was confided to Herbert's care to be delivered to the Duchess of Richmond, which duty was faithfully performed. Another watch, a gold alarum, appears by a paragraph in Herbert's narrative to have been purloined by a general officer of the Praise-God-Barebones fraternity.

In Brayley and Britton's 'Description of Cheshire,' in the 'Beauties of England and Wales,' we read that at Vale Royal Abbey, which was in 1801 the residence of Thomas Cholmondeley, and since of Lord Delamere, was a watch said to have belonged to Charles I., and to have been given by him to Bishop Juxon upon the scaffold. This watch came into the Cholmondeley family by an intermarriage with the Cowpers of Overleigh, near Chester, who were related to the Juxon family.

In Horsfield's 'Sussex,' published in 1835, we read:—"In the chancel of Ashburnham Church are kept, in a

glass case lined with red velvet, some relics of the unfortunate Charles I. These consist of the shirt, with ruffled wrists (on which are a few faint traces of blood) in which he was beheaded; his watch, which at the place of execution he gave to Mr. John Ashburnham. . . . . These articles have certainly been carefully preserved. Long were they treasured by as precious relics, fit only to be gazed upon by the devotees of the Icon Basilike. At length, however, the charm was broken by Bertram Ashburnham, Esq., who, in 1743, bequeathed them to the clerk of the parish and his successors for ever, to be exhibited as great curiosities." The correctness of the legend as to the gift of the watch by the king may be doubted. It would seem that John Ashburnham was not near the king on the morning of his execution, and certainly not upon the scaffold with his royal master; the watch therefore could not have been given to him at the place of execution.

The late president of the British Archæological Association, Ralph Bernal, had a large silver watch, which was made by Richard Bowen, of London, and is said to have been given to Colonel Hammond by Charles I. whilst at Carisbrooke. It has two cases, the outer one chased and engraved with a border of flowers, and a figure of the king praying. On the back of the inner case is engraved another praying figure of a man in a gown, with Christ above, and the following legend in a scroll:—"And what I sai to you, I sai unto all, Watch." When Charles was being removed from Carisbrooke to Hurst Castle, on November 30th, 1647, he gave Mr. Worsley, who had risked his life for him, his watch, saying, "This is all my gratitude has to give." The watch is still preserved in the family. It was exhibited at a meeting of the above association when at

Shorwell in 1855, at the residence of Miss Worsley, to whom it then belonged. A drawing of it was exhibited by Mr. Joseph Lionel Williams at a meeting of the British Archæological Association, held in August, 1845. It is of silver, of rather large size, and an inch in thickness; it works with catgut instead of a chain; and the face and back of the inner case are very richly engraved. It is a repeater watch, and has nineteen openings in the outer case for the escape of the sound. It has the maker's name, "Johannes Bages, Londini, fecit."

At a meeting of the Archæological Institute, held at Gloucester in July, 1860, Mr. D. I. Niblett exhibited a watch which had been given by Henrietta Maria, the queen of Charles I., to General Rudhall.

Mr. Charles Reed, of Paternoster Row, writing to 'Notes and Queries' in 1860, says, "In 1855 I received from a person who had emigrated to Australia a bracket-clock, with a request that I would accept it as a token of his gratitude for some slight service I had been able to render him. The time-piece did not appear to be of any special value, but his letter informed me that the works were constructed from the 'celebrated Van Tromp's watch.' . . . . Upon the dial-plate I find the name of 'Booth, Pontefract.' Inside the stand I have discovered the lower half of a saucer-shaped cover of shagreen, and the works, as adapted to this clock, exactly fit into this cover. The works are evidently of foreign manufacture, the mainspring is in perfect order, and the keys are attached. The watch-face was probably removed by Booth." It is said that the watch passed from Booth with "the writings" to a George Booth, who went to America, and died at Brooklyn there. We remind our readers that the

Dutch admiral, Van Tromp, sailed with his fleet through the Straits of Dover in May, 1652; and was beaten in an engagement there by the English under Blake.

In the Ashmolean Museum, Oxford, is a watch which is said to have belonged to Oliver Cromwell. Mr. J. H. Fawkes, of Farnley Hall, had a watch which is also stated to have been once owned by him. It bore the name of Jaques Cartier as the maker, and was a clock-watch, which struck the hours; the outer case was of leather, perforated, and studded with silver. In Scott's 'Antiquarian Gleanings in the North of England' this watch is said to be a repeater, by which no doubt was meant a striking-watch. The repeating movement was of later date than this specimen. At Chequers Court, Buckinghamshire, the seat of Lady Frankland Russell, is a watch which once belonged to Cromwell. Messrs. Hawkesley and Co. have an ancient silver watch, with a glass covering to the face, the maker being Young, which also is said to have belonged to the same individual. In the 'Gentleman's Magazine' for 1808 is an engraving representing three views of a watch which formerly belonged to him, and which he took out of his fob at the siege of Clonmell, and presented to the ancestor of Colonel Bagwell, whose it then was. The name of the maker, William Clay, was engraved on the work inside. The outer, or golden circle, indicating the day of the month, revolved one division every twenty-four hours; whereby the number of the day was opposed to the index hand above. This watch is now in a private room at the British Museum.

It is related of Charles II. that when he was present at the amusements in the Mall, his watchmaker, Edward East, used to attend him, as a watch was often the stake played for. Watches would seem at this

period to have been curiosities, and their internal mechanism a marvel. We find gossiping Samuel Pepys, then Secretary to the Admiralty, visiting Lord Brouncker, and feasting his eyes with a sight of the movements of his lordship's watch. In his 'Diary' he thus records his visit, which was on December 22nd, 1665: "I to my Lord Brouncker's, and there spent the evening by my desire in seeing his Lordship open to pieces and make up again his watch, thereby being taught what I never knew before; and it is a thing very well worth my having seen, and am mightily pleased and satisfied with it."

In the 'Mirror' for 1833 is an engraving representing a curious heart-shaped watch-key, the original of which was given by Charles II. to the Pendrell family, as a mark of his gratitude for their having been very instrumental in his preservation. It was the size of the engraving, and made of the heart of oak; it was about three-eighths of an inch thick, was faced on each side with a plate of silver, and was surmounted by an acorn of the same metal. On one side was engraved a branching oak, with the head of Charles II.; and on the other was the following inscription:—"Quercus Car. 2d. Conservatrix 1651." The pipe of the key was of brass. This relic was in the possession of Mrs. Cope, of No. 3, Regent Street, Westminster, who was a descendant of the Pendrell family.

To the French we are indebted for the art of painting in opaque enamels, and for the application of it to the ornamentation of watch-cases. In 1630 Jean Toutin, a goldsmith of Château Surr, and a great master in painting in transparent enamels, applied himself to the use of thick colours of different tints, which should melt with fire and yet retain their lustre. He succeeded; and, as

he used thin plates of gold for the foundation of his work, this style of enamel painting became available for a variety of ornamental purposes. Toutin did not keep the discovery to himself, but generously told his fellow-artists of it. Dubie, a goldsmith, who worked for the king at the Louvre, was the first who distinguished himself in this new work. After him came Morlière, a native of Orleans, who worked at Blois, and employed himself chiefly in painting rings and watch-cases; but he was excelled by his pupil, Robert Vanquer, of Blois, who produced works superior to his master, both in design and in colour. He died in 1670. Chartière, of Blois, was celebrated for his beautiful paintings of flowers; and Huand le Puisné, for figures.

In 1849 Mr. O. Morgan exhibited at a meeting of the Society of Antiquaries a watch, the enamel case of which was the work of Toutin; the subject of the outside painting being the 'Histoire d'Apian,' as an inscription near the pendant indicated. The inside of the case was painted with landscapes in enamel; the dial also was enamelled, having a subject of figures in the centre, surrounded by a white circle, on which were marked the hours. This was perhaps the first instance of an enamel dial-plate, and as the date of this watch was about 1635, we may assume that watch-dials were first enamelled about that time.

At a meeting of the Archæological Institute held on June 6th, 1862, Mr. Morgan exhibited the following remarkable series of watches exemplifying the application of enamel to the enrichment of personal ornaments. A watch, the case of which was ornamented with flowers in opaque and transparent enamels, the date being early in the seventeenth century. An exquisitely finished enamel watch-case, the work of Jean Toutin,

the inventor, the date being between 1630 and 1640, and the subject, Nymphs bathing, after Polemberg. An enamelled watch, the case being finely painted by Henry Toutin, brother of the inventor, and a goldsmith and enameller at Blois, between 1630 and 1640; the subject, a series of illustrations of the story of Tancred and Clorinda, from 'Orlando Furioso.' A watch enamelled by the same artist, date 1630 to 1640, the subject being the 'Histoire d'Apian.' An enamelled watch, the case of which was beautifully ornamented with flowers raised in relief, and enriched with diamonds. The artist of this unique specimen was not known, but the movement was by D. Bouquet, who was living between 1630 and 1640. A small watch-case exquisitely painted in brilliant colours, the artist probably being either Morlière or Vanquer, between 1630 and 1650. An enamelled watch, with subjects in illustration of the birth and early life of Christ, the painting being very fine, and the whole case enriched with turquoises, the date 1630 to 1650, and the artist unknown. Two enamelled watches, the cases being exquisitely painted by Huand le Puisné, in the latter half of the seventeenth century. An enamelled watch of very fine work, the artist being I. L. Durant, who flourished in the same century, and is mentioned by Siret in his 'Dictionary of Painters.' An enamelled watch of beautiful work by an unknown artist, the date being the latter part of the seventeenth century. The chased gold case was by H. Manby, and, together with the movement, later than the enamel. Two watches, the cases of which were enamelled on copper by a French artist named Mulsund, at the end of the seventeenth or beginning of the eighteenth century. And two watch-cases of Battersea enamel, about 1750. At the same meeting the following gentlemen

exhibited the under-mentioned specimens of watch enamelling:—By the Earl Amherst, an enamelled watch of the seventeenth century; on one side was represented the Holy Family, and on the other, St. Catherine; the movement bore the name of "Auguste Bretonneau, à Paris." By Mr. T. M. Whitehead, a beautiful cruciform gold watch, or *montre d'abbesse*, elaborately enamelled in opaque colours. On the face, which was protected by a crystal, was seen Christ, with the emblems of the Passion; and on the back, the Crucifixion. This was by a German artist, late in the seventeenth century, and resembled the works of Dinglinger, of Dresden. The movement bore the name of "Johannes Van Ceulen, Hagæ," and had a pendulum spring, a mechanism not known before 1675. By Mr. A. W. Franks, a small enamelled watch painted by Huand the younger, and signed "Huand le Puisné fecit." By Sir Charles Anderson, Baronet, a circular enamelled plate, probably for a watch-case: it bore the arms of James IV., Duke of Lenox, K.G., Lord Warden of the Cinque Ports, and Hereditary High Admiral of Scotland, who died in 1655. In a bordure round the achievement were introduced anchors in allusion to his naval office. This was painted in colours on a white ground. By Mr. W. Russell, an exquisitely enamelled watch, the movements of which were by Nicholas Bernard, of Paris. And by Mr. Colnaghi, an enamelled watch-case, exhibiting the portrait of George II.

At a meeting of the Society of Antiquaries, held on March 24th, 1859, Mr. Richard Frankum exhibited an oval gold watch, enamelled white, and studded with garnets. A large stone was on the back and front, which opened, and appeared originally to have concealed miniatures. The face was of gold, with delicate ena-

melled foliage. From the lower end hung a diminutive figure of St. George and the Dragon. A similar watch is represented in a portrait of Charles I.

The Earl of Stamford and Warrington has a small egg-shaped watch, the cases of which are cut out of jacinths; the cover is set round with rose-diamonds; it has an enamelled border; the face appears through the transparent jewel. This little gem is of the seventeenth century, and was made by David Gom, à Lyons.

In the South Kensington Museum is a watch in a rock-crystal case, the back of which is cut into facets. It has a black shagreen silver-mounted outer case. The length of the watch is one inch and five-eighths, and the width one inch and a quarter. It is of the seventeenth century, and was purchased at the Bernal sale for 11*l.* 10*s.* In the same museum is an octagonal watch in a rock-crystal case; the sides are in turquoise-blue glass, with gilt metal mounting. The height is two inches and five-eighths, and the width one inch and a quarter. The makers' names are Conrad and Reiger, German workmen. This watch was bought at the Bernal sale for 4*l.* 10*s.* Also an octagonal watch, the case of which is enriched back and front with dark-blue glass paste, with arabesque ornaments in gold and enamels. The height is one inch and three-quarters, and the width one inch and one-eighth. The maker's initials are A. B. L. This article was purchased at the Bernal sale for 5*l.* Also an oval watch in silver, with gilt metal mounts, richly engraved with allegorical figures, arabesques, and landscapes. The maker's name is "Niel Hubert, à Rouen;" and the date is the seventeenth century. The height is three inches, and the width two inches and one-eighth. This watch was bought at the Bernal sale for 5*l.* 10*s.* Also a silver

watch, with pierced back and sides, and chased with flowers. The dial is of silver, engraved, the hours being enamelled in black. The maker's name is "Estienne Hubert, Rouen." The length is two inches and a quarter, and the width one inch and seven-eighths. It was purchased at the Bernal sale for 6*l*. 5*s*. Also a watch enamelled in gold, painted inside and out with flowers, and marked inside "Jacques Huon, à Paris." It is of the seventeenth century; its diameter is two inches and a quarter; and it was purchased for 30*l*. Also a gold watch, the cover of which is painted in enamel on both sides with groups of Charity and Faith. On the dial is a landscape subject. The maker's name is Nicholas Bernard, of Paris. The diameter is two inches and a quarter. This watch was purchased at the Bernal sale for 15*l*. 15*s*. Also a gold watch, the case of which is richly decorated with foliated scrollwork in relief, perforated and enamelled. The maker's name is "Claude Pascal, à la Haye." The diameter is two inches. This watch was purchased at the Bernal sale for 33*l*. And also a gold enamelled watch, on the back of the case of which are portraits of an Elector and Electress of Brandenburg in classical costume. In the centre of the dial are Diana and Endymion; and round the sides are landscapes in medallions. The makers' names are "Les deux Frères Heraut de Son, F. F. à Berlin." The diameter is one inch and five-eighths. This watch was purchased at the Bernal sale for 14*l*. 10*s*. Mr. R. J. Burnside has an enamelled watch of the seventeenth century, of French manufacture. Miss F. A. Cameron has a gold watch, enamelled with a classical medallion. It is attached to a chatelaine of similar character, with two seals and a key.

A correspondent of the 'Gentleman's Magazine' for

1810, states that an enamelled watch of early date had then lately come into his possession; it was the counterpart of the one which Mrs. Joyce Frankland holds in her hand in the engraving in Churton's 'Life of Dean Nowell,' from the picture of that lady in the hall of Brasenose College, Oxford, made about the middle of the sixteenth century. The watch in form resembled that which we now term a hunting-watch; but it was more than double the size of any watch at present in use. The outer case was not of gold, but of a metal which much resembled fine pale brass, or some mixed metal. The inner case was covered with figures exquisitely wrought in the most beautiful enamel. The maker's name was "Jeban (Jehan) Augier à Paris." A writer to 'Notes and Queries' says, "I have recently examined an ancient watch, which is said to have belonged to a character eminent in English history. The name of the maker of the watch inscribed on it is "Jehan Augier à Paris."

The reader will gather from the above that early watches were often very beautiful with their decorations of enamel. Many too were also most elaborately engraved and otherwise ornamented. Thus we find in the South Kensington Museum a watch set in a medallion of mother-of-pearl, decorated with cameo portraits and trophies in gilt metal. The whole is enriched with precious stones. The diameter of the watch is one inch, and of the medallion five inches and three quarters. It was purchased for 55*l*. Also a silver watch, the sides and back of which are engraved with flowers and scrolls. The dial is engraved with the hours, and the days of the month; the maker's name is J. Bock; and the diameter is two inches. This watch was purchased at the Bernal sale for 9*l*. 10*s*. Also a silver watch, the

back and sides of which are engraved with figures of the Seasons and with flowers. The maker's name is Jean Rousseau; and the height of the article is two inches and a quarter, and the width one inch and seven-eighths. It was purchased at the Bernal sale for 3*l.* 5*s.* Also the three following watches, all of which were originally in the Bernal Collection:—An oval silver watch, richly chased with arabesques and scrollwork. The dial-plate is of gilt metal engraved; the length is two inches and three-eighths, and the width one inch and a half; and the maker's name is R. Ridgette. This watch was purchased for 4*l.* An octagonal silver parcel-gilt watch, the sides, back, and front of which are engraved. The maker's name is "C. Carncel à Strasbourgh;" and the height is two inches, and the width one inch and an eighth. It was bought for ten guineas. A silver watch, the back of the case of which is embossed to resemble a rose. The maker's name is Benjamin Rotherodd; and the length is one inch and five-eighths, and the width one inch and a quarter. This article is of the seventeenth century, and it was purchased for 7*l.* 15*s.* In the same Museum is a watch in a crystal case in the form of a fleur-de-lis, by "G. Senez, horloger du Roi, à Rouen," 1660. The size of this article is two inches and a half by one inch and a half; and it was purchased for 12*l.* And also another watch in a crystal case, oval in shape, and facet cut. This is in size two inches by one inch; its date is the seventeenth century; and it was purchased for 8*l.* Mr. J. Heywood Hawkins has a small oval silver watch, engraved with flowers on the outer case. The maker was "Jo. Midnall in Fleet St." Another existing watch of gold has an embossed allegorical representation of the four Seasons at the back, and

is inscribed, "Joseph Martineau, senior, London, No. 1142."

Watch-keys also were developed into very decorative articles, and some which have been preserved exhibit considerable taste in their designs and construction. In the South Kensington Museum is one in gilded bronze, representing a siren. It is of Italian cinque-cento work; the length is one inch and five-eighths; it was formerly in the Soulages Collection; and it was bought for 1*l.*

About the year 1650 metal chains were commonly substituted for the catgut cord before in general use.

The durability of watches when well made is very remarkable. One was produced in going order before a committee of the House of Commons to inquire into the watch trade, which was made in the year 1660; and many of ancient date which can still be kept going are now in the possession of the Clockmakers' Company.

In the 'Kingdome's Intelligencer' of February 4th–11th, 1661, is advertised as lost "a round high watch, of a reasonable size, showing the day of the month, age of the moon, and tides; upon the upper plate, Thomas Alcock fecit."

Lady Fellows has an oval silver-gilt plain watch, with pounced letters O. C., and a sword in front. On the back are the words "For God and the Commonwealth;" and on the dial-plate "A. Hooke, 1661." The initials and the motto seem to point to the time of Cromwell; but the date is subsequent to his rule, and in the reign of Charles II.

The following case, abridged from Lord Stair's 'Collection of Decisions of the Court of Session,' relates to a strange occurrence which took place in the Parliament of Scotland in 1662:—"The Lord Couper alleging that, being sitting in Parliament, and taking out his

watch to see what hour it was, he gave it to my Lord Pitsligo in his hand, and that he refuses to restore it; therefore craves to be restored, and that he may have the value of it *pretio affectionis*, by his own oath. The Defender alleged, and offers to prove, that the Pursuer having put his watch in his hand, as he conceives, to see what hour it was, according to the ordinary civility, they being both sitting in Parliament, the Lord Sinclair putting forth his hand for a sight of the watch, the Defender did in the Pursuer's presence put it in his hand without the Pursuer's contradiction, which must necessarily import his consent and liberate the Defender. The Pursuer answered: the Defender having put forth his hand, signifying his desire to call for the watch, the Pursuer put the same in his hand—meaning that which is ordinary, to lend the Defender the watch to see what hour it was—which importeth the Defender's obligement to restore the same. The Defender's giving of the watch to Lord Sinclair was so subit an act, that the Pursuer could not prohibit, specially they being sitting in Parliament in the time; and, therefore, his silence cannot import a consent. The Lords (*i. e.* of Session) repelled the Defence; but would not suffer the price of the watch to be proven by the Pursuer's oath, but *prout de jure*."

In a newspaper of 1678 appeared the following advertisement:—"Lost or stolen the 3d instant, a Gold Watch with a steel Chain, the Case studded with Gold, and lined with pink coloured Sattin, a bunch of small green taffata ribon ty'd to it. Who can give notice thereof to Mr. Richard Cooke next door to the Star Inn in the Strand near Chairing-cross, shall have 40*s.* or if it be bought, there money again with content. The Watchmaker's name is Henricus Toung."

In the account of charges for work done by a gold-

smith in February, 1679, we find the following:—"Item, for dresing a wach keey, 3*l*."

In the 'Autobiography and Anecdotes by William Taswell, D.D.,' 1651–1682, published by the Camden Society in 1853, we read:—"After this (1680), I never was without money as long as I stayed in the university. I bought several books, clothes, a silver-hilted sword, a gold watch, and many cups, besides a great number of bows and arrows, with which I exercised myself sometimes, and at no small price. In short, whatever my desire could fancy I had."

In the South Kensington Museum is a gold watch, the case of which is enamelled in blue with a border of flowers in coloured enamels. The dial-plate and interior of the case are enamelled; in the latter is an oval medallion with a figure of Minerva painted. The maker's name is "Pieter Wresback, Haghe, 1680." The diameter is one inch and three-eighths. This watch was purchased at the Bernal sale for 6*l*. Also a gold enamelled watch, the maker of which was Pierre Duhamel, 1680. The height is one inch and a half, and the width one inch and a quarter. This article likewise was bought at the Bernal sale for 7*l*. 15*s*. Also a carriage-watch, with a silver dial and richly-engraved and perforated gilt-metal case. The diameter is three inches and a quarter. The watch was purchased for 4*l*. Also a clock, or travelling watch, in gilt metal, with a red leather case, five inches square. The height is two inches and three quarters. The article was purchased for 8*l*. Also a silver carriage-watch, the outer case of which is embossed with the story of Alexander and Diogenes. The inner case is chased and perforated with arabesque ornaments. It is believed to be Augsburg work, about 1690; its height

is four inches and a half, and its width four inches; and it was bought for 14*l.*

In the 'London Gazette' for October 21st to 24th, 1689, was the following advertisement:—"Lost the 21st Instant between the Hay Market near Charing Cross and the Rummer in Queen Street near Cheapside, a round Gold Pendulum Watch of an indifferent small size, shewing the hours and minutes, the Pendulum went with a strait Spring, it was made by Henry Jones, Watchmaker in the Temple, the Out-Case had a Cypher pin'd on it, and the Shagreen much worn. If it comes to your hands, you are desired to bring it to the said Mr. Jones, or Mr. Snag, a goldsmith in Lumbard Street, and you shall have two Guineas Reward."

At a meeting of the British Archæological Association, held on December 10th, 1862, Mr. Baskcomb exhibited some articles which had been found in making alterations in the Manor House, Chislehurst, Kent. Among them was a silver watch, which was discovered in a small cupboard that had long since been built up in a wall in a passage. This watch was of the second half of the seventeenth century, and an inch and a quarter in diameter. The face was covered with a convex glass; and the dial, of brilliant emerald green translucid enamel, was surrounded by a circle of white enamel, on which the hours were marked in Roman numerals, and the half-hours with dots in black. The gilt hands were elegantly perforated, as was likewise the cock. On the plate was engraved the maker's name, "Roumieu à Rouen." The metal case was covered with black leather, decked with knot-work and numerous rosettes of silver piqué. Rouen was once famous for its watches, and the Hubert family seem to have been the chief makers there during the seven-

teenth century, Noel and the two Etiennes being its most noted members. The productions of Roumieu are less known than those of the Huberts.

At a meeting of the above-named Association, held on December 9th, 1863, Mr. Henry Godwin, F.S.A., of Speen Hill, Newbury, exhibited a handsome silver watch, of the second half of the seventeenth century, two inches and a quarter in diameter. The face was elegantly chased, the hours in Roman figures, and the minutes in Arabic numerals, being filled with black enamel. Beneath the dial was a kidney-shaped aperture, exposing a portion of the balance-wheel and hair-spring; and on the margin of this opening was engraved, "Rich: Rooker: London." In the centre of the flat, solid, silver-gilt back-plate the name was repeated thus:—"Richard Rooker, London, 325." This number was also stamped on the inside of the case.

At a meeting of the Archæological Institute, held in 1847, Miss Burdett submitted for inspection a singular double-cased watch, the under side of the silver case of which was fashioned like the shell of a nautilus. The maker's name appeared in the interior, "Salomon Chesnon, Blois." The dial-plate was engraved with landscapes, figures, and foliated scrolls. From the character of its ornaments, the date of this article was assigned to the latter part of the seventeenth century. It is engraved full size in the 'Archæological Journal,' vol. v., p. 83. At a meeting of the last-named Institute, held on May 5th, 1854, Mr. J. E. Rolls exhibited a small watch made by "Salomon Chesnon, à Blois." It had no hands, the hour being indicated by an escutcheon engraved on a circular plate, which revolved within the circle showing the hours; this escutcheon was charged with the following coat:—On a cross engrailed, be-

tween four eagles displayed, five lions passant. The back of the inner case was engraved, representing a gentleman and a lady, who held a bow. Lady Fellows has a very small round gold watch, with a white enamelled dial, in an outer metal case of gold piqué on leather; the maker being Salomon Chesnon, à Blois. Diminutive watches enclosed in quaint cases, not infrequently enamelled, were chiefly made at Blois, in the Orleannois, a city once famous for its horology. In the museum of the Archæological Institute is preserved a watch, rather smaller than the above-named nautilus example, in a ribbed silver case, of the same manufacture, and about the same date, the maker being "M. Alais, Blois." It was presented by the Rev. R. Wickham, of Twyford. At a meeting of the same Institute, held on April 7th, 1854, Mr. Charles Tucker exhibited a small oval watch, in the form of a shell, of silver enamelled, with a crystal over the face. The maker's name is "Henry Beraud fecit."

A great improvement was commenced in watchmaking, in 1658, by the invention of the spiral or pendulum spring, applied to the arbor of the balance, by which means effects were produced in its vibrations similar to the action of gravity on the pendulum of a clock. Prior to this invention, the performance of watches was very irregular, serving to give the time only approximately. The first idea of the pendulum spring is attributed to Dr. Hooke, the celebrated mathematician, who originated it in 1658; but in 1660 the invention was improved, and in 1675 it was skilfully carried out by Thomas Tompion, the celebrated watchmaker, under Dr. Hooke's superintendence. Tompion made a watch with a pendulum spring for Charles II., with this inscription:—"Robt. Hooke, in-

venit 1658. Thos. Tompion, fecit 1675." At a meeting of the Archæological Institute, held on April 4th, 1862, the Rev. Gregory Rhodes exhibited a silver watch, the movement of which had a regulating spring, and was believed to have been made under the direction of Dr. Hooke. It had been preserved with the family tradition that it was presented by Charles II. to Captain Nicholas Tatterell, through whose loyalty that king was conveyed to France after his defeat at Worcester in 1651. He was rewarded with a pension, which was continued for three generations. A slab in the old churchyard at Brighton records his death in 1674. Mr. Morgan, who in his observations on watchmaking, in the 'Archæologia,' vol. xxiii., p. 93, describes Dr. Hooke's improvements, is of opinion that this watch was made not earlier than 1675, but probably towards the end of the seventeenth century. Prior, in his 'Essay on Learning,' says that Tompion, "who earned a well-deserved reputation for his admirable improvements in the art of clock and watch making, but particularly in the latter, originally was a farrier, and began his great knowledge in the equation of time by regulating the wheels of a jack to roast meat." He died in 1713. His portrait, engraved in mezzo-tinto by Smith after a painting by Kneller, which represents him in a plain coat, showing the inside of a watch, was published in 1697. Tompion was so jealous of his reputation as a watchmaker, that he would not let his name appear on any of his work which was not the best of its kind; and it is related that on the occasion of a person applying to him on the subject of a watch upon which his name fraudulently appeared, he at once broke it with a hammer, and presented another one to the person, saying, "Sir, here is a watch of my making." A

rival claim to the invention of the spring to regulate the action of the balance-wheel, which was undoubtedly devised by Dr. Hooke, and brought into use by Tompion, was made by Huygens, and also by a Frenchman; but the credit of this important discovery appears to be fairly due to our own country. John Hauteville, an ingenious mechanic, and the author of a great many curious pamphlets, who was born at Orleans in 1647, and died in 1724, claimed to be the inventor of the method of making watches with spiral springs.

Until nearly the close of the seventeenth century watches had only one hand, namely, that which pointed to the hours; but by the application of the pendulum spring, and the means thereby afforded for regulating the oscillations to the greatest nicety, watches now performed with such precision, that minute and wheel hands, which made the revolution of the dial every hour, were soon added, and so the smaller subdivisions of time were indicated. This improvement is said to have been made by Daniel Quare, a quaker, and a famous London clockmaker of that period. Many of the old watches were then altered to receive the spiral springs and other later improvements.

In 1676 Daniel Quare invented the repeating movement in watches, by which they were made to strike at pleasure. A repeating-watch, or a repeater, is one that is supplied with mechanism, by putting which in action, the wearer is enabled at any time to ascertain by the vibrating sound the hour within certain limits. This is usually effected by compressing a spring, which causes a hammer or hammers to strike on a bell the hours and quarters. And here we may introduce what Bolingbroke says in the fourth of his 'Letters on the Study of History,' 1711, in relation to

a certain person:—"His reason had not the merit of common mechanism. When you press a watch or pull a clock, they answer your question with precision; for they repeat exactly the hour of the day, and tell you neither more nor less than you desire to know." One of the first of these repeating-watches was presented by Charles II. to Louis XIV. of France. A clergyman named Edward Barlow also invented a contrivance similar to that of Quare, and applied for a patent for the sole making of all pulling and repeating clocks and watches. The Clockmakers' Company petitioned James II. not to grant this patent; and in consequence thereof he appointed March 2nd, 1687, for hearing the reasons urged against it, before the Privy Council. The result was that Barlow's application was refused; and the king, after a trial of each of the respective repeating-watches made by Quare and by Barlow, gave the preference to the former, which fact was notified in the 'Gazette.' Quare afterwards made for William III. a highly-finished repeating-watch, which is still in a good state of preservation.

The identical watch that Quare made for James II., and that was preferred by him, was in the possession of John Stanton, of Benwell, near Newcastle-upon-Tyne, when, in a letter to the 'Morning Chronicle,' dated December 11th, 1823, he gave the following description of it:—"The outer case, which is of very pure gold, is embossed with the king's head in a medallion, under which on the right is Fame in the clouds, with a trumpet at her mouth, which is held in her left hand; in her right is a wreath, which she is raising as if to crown him. On the left are two winged boys supporting the royal crown; under them a tower and fortifications, on which a flag is flying; under all is the sea running close

up to a fort, and on the sea is a ship under sail. This case is also beautifully engraved and pierced with scroll-work, ornamented with cannon, mortars, shot, shells, kettle-drums, colours, and other trophies of war, and with crowns, sceptres, and other emblems of royalty. The face is of gold with black Roman letters for the hours, and figures for the minutes. In the centre is a piece of pierced work in gold upon blue steel, representing the letters J. R. R. J., combined so as to appear like an ornamental scroll, above which is the royal crown. The box is exquisitely pierced with scrollwork intermixed with birds and flowers; about the hinge is engraved a landscape, with a shepherd sitting under a tree, playing upon a pipe, with a dog at his feet, and houses, trees, &c., in the distance. On the back of the box two circular lines are drawn, between which is the following inscription:—'James II. gloria Deo in excelsis sine pretio redimi mini malâ lege ablatun bno. Regi restituitur.' Within the circle described within the inner line is engraved a figure of Justice in the clouds, reclining upon her left elbow, the hand holding the scales; in her right hand is a sceptre, with which she points to three bishops beneath her, with an altar before them. On one side of the altar is the Tower of London, with a group of 26 men carrying bags (I presume intended to represent money). On the other side is a view of the City of London in perspective, and a group of 29 men carrying similar bags, of which there are several more lying in the foreground; under all a lion and a lamb are lying together. The watch is considerably thicker than, but otherwise not much above, the common size; and every part of the engraving beautiful and distinct. It goes accurately, and is in a perfect state of preservation."

A patent was granted to Daniel Quare on August 2nd, 1695, for the invention of a portable weather-glass or barometer. He was much respected by the trade to which he belonged. At his funeral, on March 30th, 1724, most of the watchmakers in London were present. He was interred in the Quakers' burying ground at Bunhill Fields. Several artists followed in the same line as himself, particularly Tompion, Julien Le Roy, Collier, Larçay, and Thiout.

Quare's rival, Edward Barlow, whose real name was Booth, was born near Warrington, and ordained in the English College at Lisbon. He took the name of Barlow from his godfather, Ambrose Barlow, a Benedictine, who suffered at Lancaster for his religion. Dodd, in his 'Church History,' says of Barlow:—"He has often told me that at his first perusing of Euclid, that author was as easy to him as a newspaper. His name and fame are perpetuated for being the inventor of the pendulum watches; but according to the usual fate of most projectors, while others were great gainers by his ingenuity, Mr. Barlow had never been considered on that occasion, had not Mr. Thompson (accidentally becoming acquainted with the inventor's name) made him a present of 200*l*. He published a treatise on the origin of springs, wind, and the flux and reflux of the sea, 8vo, 1714, and died about two years afterwards, nearly eighty-one years of age."

The Rev. G. S. Wasey has a magnificent gold repeater by Tompion, apparently as good as ever it was, and weighing over six ounces. Madame Beauzalie, of Paris, had a large gold repeating-watch, set with diamonds, and that chimed the hours. It formerly belonged to the King of Spain. In the South Kensington Museum is a gilt-metal repeating-watch, chased and

pierced, the sides being ornamented with hunting subjects, and the back with scrollwork; the dial is engraved and gilt. The maker's name is "Thomas Taylor, in Holbourn;" the diameter is two inches and a quarter; and the article was purchased at the Bernal sale for 3*l.* 10*s.*

In the 'Philosophical Transactions' appears an account by Godfrey William de Leibnitz of his portable watches, in 1675. This eminent mathematician and philosopher was born at Leipzig in 1646, and died in 1716.

In 1680 Clement, a London clockmaker, invented the anchor-escapement; and in 1695 Thomas Tompion invented the cylinder-escapement, with the horizontal wheel; but this plan was not brought into use until the following century.

The engraved portrait of Edward Backwell, Alderman of London, who died in 1679, was published; it represents him in a flowered gown, with a watch. In a gallery at Hampton Court Palace is the portrait of a man with a watch in his hand, the artist being Peter Van Aelst, who flourished in the seventeenth century.

There is extant a round silver watch, with double case, of the time of William III., which measures upwards of two inches in diameter, and one inch and a quarter in thickness. In the centre of the dial-plate is chased a shield, with an escalop-shell and a satyr's head; and on it is engraved the maker's name, "Wise, Reading." The hours are in Roman numerals, the minutes marked with strokes, with the five minutes distinguished in Arabic numbers on ovals outside the circle of strokes. The figures are engraved on silver filled in with black enamel. The hands are of blue steel. On the back-plate is inscribed "Luke Wise, Reading;" and the cock is very richly wrought.

A touch-watch is one by which the time of day may be felt. Brequet invented *une montre de touche*, in which the hours were indicated by eleven projecting studs round the rim of the case, while the pendant marked twelve o'clock. In the centre of the back of the case was placed an index or hand, which when moved forward would stop at the portion of the hour indicated by the watch, so that by means of the studs and pendant the time could be easily felt and counted. For instance, at half-past two the index would stop in the middle of the space between the second and third studs from the pendant. To the blind, as well as to persons travelling by night, these touch-watches must have been invaluable. The subjoined advertisements for the recovery of touch-watches, which had been stolen, occur in newspapers of the years 1678 and 1692 respectively:—"Lost out of a person's pocket, upon Wednesday night, being the 27th of November, betwixt Princes Street and St. John's Street (Clerkenwell), an old flat silver watch, with a studded case, and little knobs against each hour to feel what's o'clock. It was made by Mr. John Bayes. Whoever brings it to Mr. Adams, a barber, in Stanhope Street, near Clare Market, shall have twenty shillings reward." In the 'London Gazette,' No. 2844, February, 1692, we read:—"Lost, between Pickadilly and St. James Street, on Monday last, in the evening, a gold watch, made fast in a gold studded case, with high pins on each hour; made by Mr. Taylor, at the end of Fetter Lane, Holborn. Whoever brings it to Mr. Harrison, goldsmith, at the 3 Flower de Luces, in the Strand, shall have a guinea reward." The late Duke of Wellington possessed a fine watch of this description, which was presented to him by the King of Spain. A touch-watch for the use

of the blind was exhibited by Mr. Dent in 1851; it was of his own manufacture.

A satirical poem, published in 1690, entitled 'Mundus Muliebris,' describing a fashionable lady's toilette, says:—

> "Gold is her toothpick, gold her watch is,
> And gold is everything she touches."

In the same poem reference is made to the lady's diamond croche, which was the hook to which were chained the wearer's watch, seals, intaglios, and the like.

The English watchmakers of the seventeenth century became so famous in their craft, that lest inferior articles should be sold abroad as their productions, a law was passed in 1698 obliging all makers to put their names on their watches.

Lady Fellows has the following watches, all of which are of the seventeenth century:—A silver watch, the outer case of which is in the form of a skull; on the back is an hour-glass and the words, "Incertite hora," "Æsterna respice," and other sentences. The case opens at the lower jaw. The maker was J. C. Vuolf. A silver cross opening to contain a watch, but the works are absent. The numerals are engraved, and outside is a lamb engraved; at the lower end is a seal, marked with the sacred monogram. A crystal-cased watch by Jean Rousseau, in the form of a cross, with gilt engraved dial-plate and small silver dial, with a landscape in the centre. An oval metal-gilt watch by John Wrighte, engraved with sacred subjects and inscriptions; round the side is a silver band of scriptural subjects, and inside the lids the crucifix and the offerings of the Magi. A gilt-metal oval watch, with a silver belt, inscribed "Vigilate et orate, quia nescitis horam."

It has an engraved dial-plate, with a landscape in the centre, and a silver ring with numerals. A metal watch-case in the form of a book, the cover being pierced to show the hours marked on the dial. A square table-watch, with iron works and gilt dial-plate, fitting into a silver case. An oval silver tulip-shaped watch by Thomas Hande, the projecting leaves being chased in a chequered pattern. The silver-engraved dial has a landscape in the centre, and a crystal face. A large round watch-case without works; it has a bell, an engraved dial-plate, and a pierced back and front of arabesque scrolls. A round silver repeater and alarum watch, with a pierced and engraved side, of Bacchus on a cask, and flowers. It has a silver dial-plate, with gilt centre, and an outer shagreen case. A round silver repeater and alarum watch by Piquet, à Rennes, with a silver-gilt centred dial-plate. A round silver alarum repeater watch by Elias Weckerlin, à Zug, with pierced flower back, silver dial, gilt centre, and a steel key. A small round silver watch by J. B. Vuicar, à Zug, with a steel hand, and an engraved silver dial-plate. A crystal-cased watch by Aymé Noel, carved with fluted rays, having a silver dial and enclosed in a silver outer case. An oval crystal-cased watch by Croymarie, carved with cross-lines and pellets, engraved gilt face, and silver dial. A round silver watch-case, chased with vertical and curved lines and flowers between, with a silver dial. A small oval silver-gilt plain watch by Robert Grinkin, of London, with crystal face and silver dial. A large oval repeater-watch, with metal open-scroll side round the bell, silver back and dial. The name on the works is "Hierosme" "Grebauul." An oval metal repeater-watch, with pierced back, small silver dial, and landscape in the centre. A large silver repeater-watch by

Jean Vallier, à Lyon, with pierced floriated ornament and white enamelled dial-plate. A round silver watch by Henry Terold, of Ipswich, with chased interlacing bands, and silver dial. A round silver watch by Louis Herve, with fluted rays and white enamelled face. An oval silver watch by Dupont, à Castres, with engraved side, of birds and squirrels; engraved dial-plate with indexes to show the hour, days of the week and month, age of the moon, and constellation; inside the cover is fitted a sundial, with box for a compass. An oval watch by G. Benard, with open gilt-metal sides, silver back and front; inside the cover is a sundial without the gnomon; the dial-plate is engraved with cherub, birds, and dogs, and has a silver ring with numerals. An oval gilt-metal watch by Papus, à Rennes, in plain cases, with gilt dial-plate, and silver ring of numerals. An oval silver watch by William North, of London, with gilt face, and two dials showing the day of the week and month, the hour, and the age of the moon. An oval metal repeater-watch by "On Cusin, à Autun," with plain cases and pierced side, and a gilt chatelaine with filigree centres. A plain oval metal watch, with black numerals and steel hour-hand, and no minutes. An oval metal watch, with engraved silver band round the side, silver dial, engraved with Time, Venus, and Cupid, and gilt border. An oval metal-gilt watch by Augustin Forfard, Sedan, with plain cases, silver ring of numerals on gilt ground, and steel hour-hand. An oval silver watch by C. Gillier, à Berne, with engraved borders and centre subjects, silver ring of numerals on dial-plate, engraved with a landscape, and chased border. A round silver repeater alarum-watch by Collet, à Rouen, with pierced floriated side, and silver dial, showing the hour and days of the month. A round silver

watch by John Drake, in Fleet Street, with plain outer case, silver dial, and steel hand. A round silver repeater-watch by Chamberlaine, of Chelmsford, with pierced flowers at the back, and silver dial, showing the hour and days of the month. A round silver watch by "Thos. Chamberlaine, de Chelmisforde," with silver dial. A silver-gilt octangular watch by Leonard Papon, à Gean, in plain case, with engraved dial, and no numerals. An octagonal silver-gilt watch by Josias Jolly, à Paris, with engraved border, and landscape in the centre of the face. An octangular metal-gilt watch in a plain case, with crystal face, and small dial; on the back is a pendulum which projects below the case. An octangular metal-gilt watch, the case being pierced at the back with geometrical ornaments, and in front with the Agnus Dei; the dial is inlaid with enamel flowers. An octangular crystal-cased watch by Pattru, cut in diamond facets, and engraved dial with Cupids and flowers. An octangular metal-gilt repeater-watch, with pierced back, engraved borders, and inlaid enamel dial. An octangular metal-gilt repeater watch, with pierced back, in floriated ornament, open sides round the bell, and silver dial with black Roman numerals. An octangular gilt repeater metal watch, with maker's initials G. H., pierced ornaments on the back, front, and side, and nielloed silver dial, with a smaller gilt dial in the centre. An octangular silver watch by Jere Johnson, of Exchange Alley, engraved with scrolls, crystal face cut in diamond facets, and silver dial with gilt border.

The following watches also of the seventeenth century belong to the undermentioned persons—Messrs. Farrer have a French gold watch, the case of which is painted on enamel, with the Holy Family and other sacred subjects. Also a gold watch by Theodore

Girard, of Blois, the back and dial of green translucent enamel, white border, and engraved with flowers. Mr. George Field has a square gilt pedestal watch by Ferment, of London, with figures of Faith, Hope, and Charity at the angles; and another with two small medallions of busts of the electors of Germany on each side; four Cupids at the top; set all over with garnets and diamonds; resting on a base supported by four eagles, and garlands between. The height is two inches and three quarters. Mr. S. Addington has a round watch, with a painted enamel case of Venus and Adonis, in an outer case of leather ornamented with gold studs in flower patterns. Also a circular enamelled watch by Stieler, à Berlin, painted with the Rape of Europa, and portraits round the edge. Also a metal circular watch, with enamelled painting of Mars and Venus. Also an enamelled watch with a portrait of William III. on horseback at the battle of the Boyne in front. On the dial is painted St. George and the Dragon. It is in a gold perforated outer case. Also a watch of quatre foil form, with a ring of ruby enamel in the centre; round the side are stone medallions with blue enamelled frames; resting on a swivel frame of silver-gilt, chased with masks and dolphins. The Rev. J. Beck has a gold watch by Boguet, of London, in a painted enamel case of Venus and Adonis; on the dial is a portrait of a lady of the time of Charles II., and inside are landscapes. Lord Willoughby de Eresby has a gold repeater-watch by Graham, of London; the outer case being inlaid with enamel flowers. Also a gold watch by Dingley, of London; the case being ornamented with appliqué gold flowers enamelled; on the dial are inlaid enamel flowers. It has a single hour-hand, and no seconds. Also a gold watch by Pierre Lagisse, with

enamelled back and dial, with painted male and female figures and landscapes round the sides and inside the case; and a coral-bead chain. Also a gold watch with back ornamented with engine-turned steel, and a rosette in the centre of rubies and diamonds, diamond hands and border round the dial.

There is extant a very handsome repeating-watch, which is still in good order, and was made by Simon De Charmes, an eminent London watchmaker, who flourished about the beginning of the last century. He built a house at Hammersmith, which is now called Grove Hall. The estate contained about twenty-five acres. About 1730 his son, David De Charmes, resided here, and was buried in the churchyard, in which is now a gravestone to the memory of several members of this family. It is said in Faulkner's 'History of Hammersmith,' that the ancestor of this family came to England at the time of the revocation of the Edict of Nantes.

CHAPTER IX.

Watch Jewelling Invented — Nicholas Faccio — Return of a Lost Watch mentioned in the 'Tatler' — Steele's Proposal for a Novel Watch — George I.'s Watch — The Old Pretender's Watch — Sir Christopher Wren's Watch — The Horizontal Escapement — Graham's Watches — Chatelaine Watches — Sir Isaac Newton's Watch — Prince Charles Edward Stuart's Watch — Gustavus Adolphus gives a Watch — Watchmaking at Coventry — Advertisement of a Lost Watch — Lord George Lyttleton's Lines with a Watch — Lord Cobham robbed of a Watch — Beaumarchais — Lines on a Watch — Perpetual Motion Watch projected by the Marquis of Worcester — Verses with a Repeating-Watch — A Soothsaying Watchmaker — Count Bruhl's Watches — Watchmaking Schools in Spain — Strange Recovery of a Lost Watch — Noble Watchmakers — Curious Liliputian Watch presented to George III. — The Watch Spiritualized — The Morality of Watches.

NICHOLAS FACCIO, of Duiller, a mathematician, who was born at Geneva, or Basle, on February 16th, 1664, is said to have first invented the application of jewels to watchwork, to diminish the friction of the pivots, at the beginning of the last century. The experiment was, however, tried much earlier. To Faccio belongs the merit of having been the first to discover and apply the art of piercing rubies, to receive the pivots of the balance-wheel, prior to, or about, the year 1700. In the 'London Gazette' of May 11th, 1704, we read: "Her Majesty having granted to Mr. Nicholas Faccio, gentleman, of the Royal Society, Peter Debaufres and Jacob Debaufres, watchmakers, her letters patent, &c., for the sole use in England, &c., for 14 years, of a new art, invented by them, of figuring and working precious or common stones, crystal or glass, and certain other

matters, different from metals, so that they may be employed in watches, clocks, and many other engines, as internal and useful parts of the engine itself, in such manners as were never yet in use. All those that may have occasion for any stones thus wrought, may be further informed at Mr. Debaufres' in Church Street, near St. Anne's. There they may see some jewel-watches, and some essays of free watches and wholly free watches, and all belong unto the same art." The inventors, Faccio and the two Debaufres, were not satisfied with their fourteen years' patent, and therefore they applied to Parliament for an extension of the term, and also for an Act for the sole monopoly of the art of clock and watch jewelling. This application was opposed by the Clockmakers' Company (*malgré* their own chartered monopolies in past times), and the matter was referred to a Committee of the House of Commons, who decided against the applicants. In the journal of the company are the following entries relating to this affair:—

1704, December 11th.—"A Special Court was called upon the occasion of Nicholas Facio, Peter de Baufré, and Jacob de Baufré, having petitioned the House of Commons for an Act for the sole applying precious and more common stones in clocks and watches, and for the enlarging the term of their patent. Their reasons for such an Act were read, as also reasons of several members of the Court by way of answer, and it was ordered that the Master, Wardens, and Assistants should petition Parliament and oppose the Bill."

1705, January 5th.—"The Master reported there had been a constant diligence used in obstructing the Bill in Parliament, brought in on the petition of Nicholas Facio, Peter de Baufré, and Jacob de Baufré, for the

sole applying precious and more common stones in clocks and watches, viz. That Parliament had been petitioned against the Bill, and that the petitioners had been heard by Counsel before the Committee on the Bill, who had made such amendments to it that they thought it best to destroy it, *and had therefore struck out all parts thereof save the words 'Be it Enacted,'* and reported accordingly. The Master also acquainted the Court, that in the proofs brought against the Bill there was an old watch produced, made by Ignatius Huggeford, that had a stone fixed in the cock and balance work, that was of great use to satisfy the Committee; and it was ordered that the Renter Warden do buy the said watch, if he can, to be kept for the members of the Court. The same was bought accordingly of Henry Masson, for 2*l.* 10*s.*, he having bought it of Henry Scale, and it was placed in the Master's hands."

There appears to be a touch of sarcastic humour about the passage which we have italicised above. The watch purchased by the company was exhibited by them to the Society of Antiquaries of London on June 8th, 1848. It was made before the use of the pendulum-spring, and had a large amethyst mounted in the cock. Huggeford was a London maker. A pamphlet, published in 1704 purports to convey the "Reasons of the English Clock and Watchmakers against the Bill to confirm the pretended new Invention of using precious and common Stones about Watches, Clocks, and other Engines;" and another contains "Reasons humbly offered by the Jewellers, Diamond Cutters, Lapidaries, Engravers in Stone, &c., against the Bill for Jewel Watches."

By the Camden Society's "Original Letters," vol. xxiii., we find that Dr. William Derham wrote to Richard

Towneley on March 28th, 1705, as follows:—"The new contrivance of applying precious stones to watches I had the good fortune to see when Mr. Facio, the inventer, and an ingenious man, and Mr. Debaufre, the workman, presented their watches, to have the approbation of the Royal Society. I found they had a better opinion of their invention than I could have: for I never thought it to deserve an Act of Parliament. . . . . One of these contrivances I remember I saw some years before in a large wooden house watch contrived and made by one Mr. Westell, an ingenious gentleman in London."

Faccio seems to have been a good scholar, and an ingenious man. Bishop Burnet, in the first letter of his 'Travels,' dated September, 1685, speaks of him as an incomparable mathematician and philosopher. In 1687 he came to England, and made the acquaintance of Sir Isaac Newton. He was a teacher of mathematics in Spitalfields, and being early one of the French prophets, he employed his pen with some acuteness, and much appearance of piety in their behalf, becoming their chief secretary, and committing their warnings to writing. In 1707 Dr. Ames, one of their brotherhood, having lately died, these impostors gave notice that he would rise again within a fortnight. Guards, however, were placed at his grave to prevent any tricks being played. At last Nicholas Faccio, John Detude, and Elias Marion were prosecuted at the charge of the French churches in London, and sentenced by the Court of Queen's Bench to stand twice on a scaffold at Charing Cross and the Royal Exchange, with a paper denoting their offence, as disturbers of the public peace and false prophets. Faccio was too lavish in the prosecution of inventions and projects, which never repaid him. He

died at Worcester in 1753. Many of his original letters and papers are in the British Museum; and among them is one of his Latin poems, entitled 'N. Facii Duellerii Auriacus Throno-Servatus,' in which he claims to himself the merit of having saved William III. from falling into the hands of the French by a stratagem of Count Fenil, a Piedmontese, which Faccio very fortunately rendered abortive in 1686. In the beginning of that poem, which contains a curious narrative of the whole affair, he lengthily and not inelegantly describes the jewel-watches of which he claimed to be the first inventor.

In the South Kensington Museum is a gold watch in a chased and embossed outer case; the gold dial is also chased. The maker's name is Debauffre, of London. The diameter is one inch and three-quarters. This watch was purchased at the Bernal sale for 11*l.* 10*s.* Mr. A. J. B. Beresford Hope has a square green enamelled watch, with a painted dial, the maker being Debaufer, of London. Probably both of these watches were made by Faccio's co-patentees; although the orthography of the names differs.

Besides the above Mr. Hope has also a gold repeater-watch, with a chased outer case, the subject being Jupiter and Juno. It is of the eighteenth century, and the maker was Herrman, of Neuberg. Also a silver repeater-watch, with white enamelled dial, the maker being Boursalt, of the same period. Also a gold watch, with complicated movements, and dials on the back and front, the date being the same as the above.

In the South Kensington Museum is a gold watch-case, chased and embossed with a mythological subject. It has perforated arabesque work borders and raised medallions, containing emblems and figure-subjects. It

is believed to be of French manufacture, about the year 1700. It was purchased for twelve guineas. In the same collection is a silver watch, the inner and outer cases of which are ornamented with openwork. The diameter of this article is two inches and a quarter; the maker's name is "Ackers, London;" the date is the early part of the eighteenth century; and it cost the nation 4*l.*

In the 'Tatler' for January 21st, 1709–10, appeared the following advertisement:—"A plain gold watch, made by Thompson, with a gold hook and chain, a cornelian seal set in gold, and Cupid sifting hearts, was dropt from a lady's side in or near Great Marlborough Street, on Thursday night last. Whoever took it up, if they will bring it to Mr. Plaistow's, at the 'Hand and Star' between the two Temple Gates, in Fleet Street, shall receive five guineas reward. John Hammond." The house bearing the sign of the 'Hand and Star' is of very ancient date; it bore that name in the times of Edward VI., Mary, and Elizabeth, when Richard Tottel published law books there. It then was, as it now is, numbered 7 in Fleet Street, and is in the occupation of Messrs. Butterworth, the legal publishers. In the number of the 'Tatler' next following the one above named appeared this letter, dated January 23rd, 1709–10:—"Mr. Bickerstaff, I am bound in justice to acquaint you, that I put an advertisement into your last paper about a watch which was lost, and was brought to me on the very day your paper came out, by a footman; who told me, that he would have brought it, if he had not read your discourse of that day against avarice; but that since he had read it, he scorned to take a reward for doing what in justice he ought to do. I am, sir, your most humble servant, John Hammond."

We read in the 'Postman' for April 13th, 1710, as follows:—"Lost, in White Conduit Fields, or thereabouts, a silver pendulum watch, with a silver chain and a brass seal to it. Whoever brings it to Mr. Greatorex, at Busby's Folly, shall have a guinea reward."

In the 'Tatler' for November 2nd, 1710, is an amusing paper, purporting to be an advertisement of certain articles which had been stolen from Lady Fardingdale by her serving-woman. Among the many articles enumerated, as part of my lady's paraphernalia, is "a large new gold repeating-watch made by a Frenchman."

Steele, in the 'Tatler' for December 16th, 1710, in reference to the prolixity of some talkers, says:—"For the utter extirpation of these orators and story-tellers, which I look upon as very great pests of society, I have invented a watch which divides the minute into twelve parts, after the same manner that the ordinary watches are divided into hours: and will endeavour to get a patent, which shall oblige every club or company to provide themselves with one of these watches, that shall lie upon the table, as an hour-glass is often placed near the pulpit, to measure out the length of a discourse. I shall be willing to allow a man one round of my watch, that is, a whole minute, to speak in; but if he exceeds that time, it shall be lawful for any of the company to look upon the watch, or to call him down to order. Provided, however, that if any one can make it appear he is turned of threescore, he may take two, or, if he pleases, three rounds of the watch, without giving offence. Provided also, that this rule be not construed to extend to the fair sex, who shall still be at liberty to talk by the ordinary watch that is now in use. I would likewise earnestly recommend this little automaton,

which may be easily carried in the pocket without any incumbrance, to all such as are troubled with this infirmity of speech, that upon pulling out their watches, they may have frequent occasion to consider what they are doing, and by that means cut the thread of the story short, and hurry to a conclusion. I shall only add, that this watch, with a paper of directions how to use it, is sold at Charles Lillie's." Charles Lillie had a shop at the corner of Beaufort Buildings, in the Strand, where he sold snuff, perfumes, and such things, and took in letters for the 'Tatler' and 'Spectator,' which were directed to him at the desire of Steele, who befriended him greatly.

At a meeting of the British Archæological Association, held on April 27th, 1859, Mr. John Clutton exhibited a richly-chased silver watch-case of the time of Queen Anne. It was two inches in diameter; the upper ring being decorated with flowers and scrolls; the lower part having in its centre a nude figure of Pallas, the goddess of war, seated, and equipped with helmet, spear, and shield; in the distance was a tent. The surrounding border was divided into eight cartouches, two occupied with vases of flowers, and two with profile busts, one being a bearded male, the other a female. The first might have been intended for a Druid, and the second for Queen Anne, for, although differing from her later portraits, it resembled some of her earlier medals. At the same meeting, Mr. Alfred Thompson called attention to a watch-case of gilt metal, barely two inches in diameter, elegantly chased with flowers, scrolls, a seated female figure, and three standing warriors. This specimen was of the time of George II., and apparently the work of George Michael Moser.

In the South Kensington Museum is a gold repeating-watch, the inner case of which is richly chased and perforated, and bears the royal arms of England. The outer case is embossed with a hunting subject. The maker's name is "Z. Michau George Albrecht." The length of the article is two inches and a quarter, and the width one inch and seven-eighths. This watch is said to have formerly belonged to George I. It was purchased at the Bernal sale for 15*l*. In the same museum is a circular watch in a rock-crystal, facet cut case, of English make, about 1720. Its diameter is one inch and threequarters; and it was purchased for 12*l*.

Mr. H. De Mere has a watch-case of gold filigree, which belonged to the Chevalier de St. George, the "Old Pretender." It is of Italian make, and of the eighteenth century.

In 1721 appeared the following advertisement:—"Lost on Wednesday the 11th instant (as supposed between Leadenhall and Spittlefields Markets), a small Gold Watch, made by Anthony Harrison in Birchin Lane, with a green spotted Blood-Stone, hanging to a black Ribbon, set in Gold; and engrav'd, the Arms, a Lyon Rampant over three Bars; the Crest, a Tyger's Head with a Ducal Coronet. If offer'd to be sold, pawn'd, or valued, stop it, and give Notice to Mr. John Chadwell, Goldsmith, in Castle Alley, Birchin Lane, and you shall have Nine Guineas Reward, and no Questions ask'd."

In Sir John Soane's Museum, Lincoln's Inn Fields, is a thick silver watch, which was formerly in the possession of Sir Christopher Wren, who died in 1723. The face of it is "with centric and eccentric scribbled o'er."

The horizontal escapement was invented in 1724 by Graham, an apprentice of the celebrated Tompion, and to whom we are indebted for two of the most valuable improvements in clocks ever made, namely, the dead-beat or Graham escapement, and the mercurial compensation pendulum. Graham's horizontal escapement is still extensively employed in the Swiss and Geneva watches; but in those of English manufacture it has been superseded by the duplex, and more recently by the lever, which is only the application of the dead-beat escapement to a watch. The inventions of Graham and Harrison, together with the art of jewelling the pivot-holes of watches, only practised in England, gave to English watches at the commencement of the last century such a pre-eminence that the wealthy of every other country sought to obtain them. Sully, writing in 1724, says that there were a number of watchmakers throughout Europe who, knowing the high value set upon English watches, made no scruple to apply the names of the most skilled masters to their vile productions. That watches of British make were highly esteemed both by the noble and the scientific the following anecdote will serve to illustrate:—Maupertius, a French mathematician, was made prisoner at the battle of Molwitz, and taken to Vienna. The Grand Duke of Tuscany, afterwards Emperor, pleased at seeing a man of such great reputation, treated him with marked kindness, and asked him whether he regretted the loss of any particular property which the Hussars had taken from him. Being much pressed to answer, Maupertius acknowledged that he wished to have saved a watch of Graham's make, which he had used in his astronomical observations. The Duke also had one by the same maker, but it was enriched with diamonds. "See," said

he, taking the watch from his pocket, and presenting it to the *savant*, "it was but a joke, they have brought it to me, and I now return it."

The reputation of Graham's watches was very great during the last century, and he became the fashionable watchmaker of the day. The 'London Magazine' for 1753 gives us an account of the ingredients required in the manufacture of a fop—"Monsieur A-la-Mode." One was—

> "A repeater by Graham, which the hours reveals,
> Almost over-balanc'd with knick-knacks and seals."

Lord Chesham has the following choice and curious watches:—A watch with an oriental agate case, set round in front with sparks of diamonds, mounted in gold. It is attached to a short gold chain; and it was made by Graham. A gold double-case repeater-watch, pierced and chased in relief with Orpheus and animals, by the same maker. It is attached to a chatelaine, chased with trophies, from which are suspended two heart-shaped lockets and two boxes. A gold double-case watch, chased in relief with the offerings of the Magi. Graham made this one also. It is suspended from a chatelaine, from which hang two seals, two broloques, and a miniature of a lady. A gold repeater-watch in a double case, chased and pierced with busts and scrolls, by the same maker. It is attached to a short gold chain. A gold double-case repeater-watch, chased and pierced with coronets and scrolls. On the back are a cipher and coronet set with diamonds. The maker was Collier, of London. It is attached to a chatelaine, containing a compass, calendar, seal, small watch in a filigree case, and two keys. A gold watch, made by Jodin, of Paris, attached to a chatelaine, both

being enamelled with hawking, animals, and birds; and with them are two enamelled scent-boxes and a key. And a gold watch set with diamonds, the centre of the case being a bloodstone. The maker was Hubert. It is suspended from a chatelaine, to which also hang tassels and a locket containing hair.

The Royal Society are in possession of a gold watch which was presented by Mrs. Conduit to Sir Isaac Newton, who was born in 1642, and died in 1727. The chasing on the outer case is beautifully executed, and represents Britannia pointing to a medallion, on which is a bust of the philosopher.

At a meeting of the Society of Antiquaries of Scotland, held on April 11th, 1864, an account of a gold watch, which was said to have belonged to Prince Charles Edward Stuart, was read by Mr. George Seaton. It appeared that this watch belonged to a lady who had then recently died in reduced circumstances, and that her maternal grandmother was the eldest sister of John Leslie, the eighth and last Lord Lindores, who died without issue in the year 1814. In the belief that this watch had formerly belonged to the Prince, and that the King of Sardinia was then the representative of the house of Stuart, its late owner bequeathed it to that monarch. Mr. Seaton pointed out that in this last matter she was clearly mistaken, as the representative of the house of Stuart was Francis V. of Modena. The watch was described as having an unusual arrangement of the Roman figures on the dial, the hours being engraved on little lozenge-shaped plates, and the filigree case having as ornaments six white stones or crystals. Dr. John Alexander Smith exhibited a curious watch, the gift of Gustavus Adolphus to a Scottish officer in his service. It was oval in shape, with cases

of rock-crystal set in silver, and an inscription, "Donum Gust. Adolphi Regis Invicti Jacobo Braimer Tribuno Militum Virtutis Præmium." The officer was Colonel Braimer, who is said to have married Lady Brunton, sister of General Leslie, who was created Earl of Leven, and it now belongs to his descendants, the family of the late Captain Braimer, R.N., of Falmouth. It was exhibited by the good offices of Mr. Ralph E. Scott.

Coventry is famous for its watchmaking, which commenced there early in the eighteenth century. In 1727 George Potter, a watchmaker, was mayor of that city. There are now several large watch manufactories at Coventry, that of Rotherham and Sons being the largest, and the only one in which steam-power is employed for turning, polishing, and other purposes. One hundred and eighty persons work on the premises. This firm was established in 1747 by Samuel Vale, and continued for many years under the names of Vale, Carr, and Rotherham.

The 'Daily Post' of Friday, February 14th, 1729, contains the following advertisement:—"Whereas a Gentleman's Coach was robb'd by two Highwaymen, between 6 and 7 of the clock, the 11th Instant in the Evening, between Hyde Park Corner and the Back of Buckingham House, in the road to Chelsea, and took away a Gold Watch and a Diamond Ring, with some money and a Sword. The watch was made by Williamson, London; and in the Case was an Equation Table by Edmund Sturgis, Watchmaker, Dublin. And the Ring had this Inscription, H. B. Knt. obt. 1 July, 1714. To the Watch there were two Seals, one a Crystal of Socrates' Head, set in Gold; another triangular with Arms engraved, viz. a Sable Cross Or, with the

Arms of Ulster, and a Scutcheon of Pertence, bearing a Butterfly, Field Azure with three Bars Gule. If any of the above-mention'd are offer'd to Sale; or if the Watch, &c. be restor'd the Person apprehending, or restoring the said Watch and Ring shall have 8 Guineas Reward; to be paid by Mr. Pote, Bookseller, at Sir Isaac Newton's Head, Charing Cross, or in proportion for any Part. Among the Pieces of Money taken, there was a Half Crown of Philip and Mary. And on the Scabbard of the Sword there was engraved, on a thin Plate of Gold, Ralph Jackson, Dublin,"

In the South Kensington Museum is a watch, with chatelaine, seal, and key attached, in gold richly chiselled and embossed. The length is seven inches and three-eighths, and the diameter one inch and three-quarters. The date is about 1730; and it was purchased for 28*l*.

Lord George Lyttleton, between the years 1730 and 1740, wrote the following lines to Miss Lucy Fortescue with a new watch:—

"With me while present may thy lovely eyes
Be never turn'd upon this golden toy,
Think every pleasing hour too swiftly flies,
And measure time by joy succeeding joy.

"But when the cares that interrupt our bliss
To me not always will thy sight allow,
Then oft with kind impatience look on this,
Then every minute count—as I do now."

Pierre Auguste Caron de Beaumarchais, who was born at Paris, in January 1732, was the son of Caron, a watchmaker of that city; and was by his father brought up to the same profession, in which he showed considerable skill, gaining a prize from the French

Academy of Sciences for an improvement in watch-making when only twenty-two years of age. This introduced him into a prominent position; Louis XV. condescended to examine a watch made by him for Madame de Pompadour, set in a ring; and that sovereign's daughter, Madame Victoria, made acquaintance with both the Caron watches and their maker. Beaumarchais was also very fond of music, and attained great proficiency in playing on the harp and the guitar. He performed before the daughters of Louis XV., who being pleased with his musical skill admitted him to their concerts, and afterwards to their parties. He who had formerly sold the ladies of the court pretty watches became their instructor on the harp, and the conductor of their musical recreations. He consequently appeared at Versailles in a rich court-dress, which fact offended a haughty nobleman, who, meeting him one day in a gallery there, asked him to look at a valuable watch that he wore, which was out of order. Beaumarchais, observing the sarcasm implied in the request, excused himself by saying that his hand was very unsteady; but the nobleman insisting, the other took the watch, and immediately dropped it on the floor, observing, "I told you so." Beaumarchais continued to enjoy the patronage of the court, which gave him the opportunity of becoming connected with some of the Fermiers-Généraux and great contractors. He became involved in several lawsuits, and gained considerable notoriety in consequence of his writing and publishing the particulars and pleadings of his case, which show great skill and power. His fame as a writer rests on his plays, and chiefly on the well-known operas, 'Le Barbier de Seville,' and 'Le Mariage de Figaro.' The character of Figaro was a happy inven-

tion, and the chief characters in both plays are drawn with much ingenuity. 'Figaro' alone produced the author eighty thousand francs. At the commencement of the revolt of the English American provinces Beaumarchais entered into a speculation for supplying the colonies with arms and ammunition; and although he lost several vessels, the greater number arrived at America, and the speculator at first enriched himself by his adventure, but eventually became a heavy loser through the alleged bad faith of the American contractors. When the French revolution broke out, Beaumarchais displayed favour to the popular cause, and entered into speculations to supply corn and muskets. But his acts exposed him to suspicion; he was accused and acquitted; then accused again, and being obliged to run away, he escaped to England and afterwards to Germany. He returned to France after the fall of Robespierre, and died in May, 1799.

In a newspaper of 1733, we read as follows:—"Last Monday morning the Right Honble. the Lord Viscount Cobham, being at New Tunbridge Wells, near Islington, had his pocket picked of a gold repeating watch of great value."

In 'Scots' Magazine' for October, 1747, are the following lines on a watch, by Mr. J. Byrom, commonly called Dr. Byrom, the inventor of a system of shorthand; and they are to be found in his printed works. The same lines are attributed to T. Hall, in 1739. They appear without the author's name in the 'Gentleman's Magazine' for May, 1749:—

"Could but our tempers move like this machine,
Not urged by passion, nor delayed by spleen,
But true to nature's regulating power,
By virtuous acts distinguished every hour;

Then health and joy would follow as they ought
The laws of motion, and the laws of thought,
Sweet health to pass the present moment o'er,
And everlasting joy when time shall be no more."

On the face of a very old watch, the outer case of which is of gold of the finest workmanship, encrusted with precious stones, is represented in enamel a landscape with a single figure, apparently that of a traveller. The sun is disappearing behind a range of mountains, and the legend round it in raised golden letters is, "Vada e vengo ogni giorno, ma tu andrai senza ritorno," supposed to be addressed by the sun to the traveller.

In the 'Gentleman's Magazine' for 1748 is an account of one of the Marquis of Worcester's projects, which was "a watch to go constantly, and yet needs no other winding from the first setting on the cord or chain, unless it be broken, requiring no other care from one than to be now and then consulted with, concerning the hour of the day or night; and if it be laid by a week together it will not err much, but the oftener looked upon, the more exact it shows the time of the day or night." This seems to have been a project for a machine to measure time by perpetual motion—the will-o'-the-wisp of many mechanicians in past ages. In the same Magazine for the following year, we find a suggestion to watchmakers, as to the construction of a watch which should move always without winding up. The celebrated French physician, Pinel, relates the case of one of the most eminent watchmakers in Paris at the end of the last century, who was infatuated with the chimera of perpetual motion, and to effect this discovery he set to work with indefatigable ardour. Through unremitting attention to the object of his enthusiasm, his mind became completely deranged. He imagined that

he had been guillotined, that his head had been mixed with those of some other victims, and that the judges, repenting of their cruel verdict, had ordered the heads to be replaced on their respective bodies. By some mistake, he conceived that the head of one of his unfortunate companions had been placed upon his shoulders; and this idea haunted him day and night; but in his madness he zealously prosecuted his endeavours to obtain never-ending motion with the aid of watch-wheels and other mechanisms. A person of a lively and jocular turn was engaged to play the following trick upon the demented horologist. Their conversation was directed to the celebrated miracle of St. Denis, who carried his head under his arm, and kissed it as he went along. The watchmaker vehemently maintained the possibility of the fact, and endeavoured to confirm it by an appeal to his own case. His companion burst out into a loud laugh, and said to him in a tone of mockery—"Why, you fool, how could St. Denis contrive to kiss his own head? Was it with his heel?" This unexpected repartee struck the lunatic forcibly; he retired quite confused, amidst the laughter that it produced; and he never after spoke of the misplacement of his head.

In the 'Gentleman's Magazine' for 1750, appear the following lines:—

"To Mira, with a Repeating-Watch.

"Mira! this machine you'll find,
Suits a moralizing mind.
Has it motion? 'tis as clear,
Action is man's proper sphere.
Equal should its progress prove,
So thro' life let Mira move.
When you forward urge its pace,
Think it may be Mira's case;

In my passage to the sky,
Have I linger'd? let me fly!
Backwards are the hands convey'd
To the points from whence they stray'd?
Blush not, Mira! to untread
Steps that wisdom never led.
If it stand, reflecting say,
Time for no machine will stay;
Heav'n observes, and will it find
Mira with him, or behind?
Mark its hands, with thanks to heav'n
For each hour, and minute giv'n;
Giv'n as means to make us wise;
Giv'n to form us for the skies.
False if either hand be view'd,
Some internal fault conclude:
Thus, if Mira's life should sin,
Let her first reform within.
When it strikes the hour, admit
Silence is not always fit.
Ev'ry day its task pursu'd,
Hints how thine must be renew'd.
Say, when winding up, alas!
Human wheels, like those of brass,
Soon their functions would forego,
Nought if foreign hand bestow.
If all day it acted right,
When she hangs it by at night,
Then let Mira ask her heart
How have I perform'd my part?
If it err'd, let Mira pray
Heav'n forgive my faults to-day!
For its use, my present prize,
All besides neglect—despise.
Shine its trinkets as they will,
Trinkets are but trinkets still:
Mira, when at court array'd
All in jewels and brocade,
If at heart no merit dwell,
If no deeds that merit tell,
Tho' a lord should smile, or king,
Thou'rt a glitt'ring useless thing.

If, whate'er its present praise,
All its power to serve decays,
Means to mend it vainly try'd,
When you cast it from your side,
On a life of virtue past
Joyful retrospection cast;
But let Mira think again
Only virtue past were vain;
Perseverance till we die,
Wins the Christian crown on high."

In 1753, a watchmaker, who was also an astrologer, was living in Bloomsbury. About this time a base girl named Elizabeth Canning trumped up a false tale about a gipsy, alleging that under Bethlehem wall she was seized, robbed, and gagged, and thence dragged to Mother Wells's, at Enfield Wash, where she was nearly starved to death. The affair caused great excitement for more than twelve months; but ultimately the girl was tried and convicted of perjury, and sentenced to seven years' transportation, on May 8th, 1754. A sooth-saying horologist cast her nativity; but he was out in his reckoning, as will be seen by a comparison of the before-mentioned facts, with the following predictory advertisement, which appeared at the time:—

"As by an Advertisement, April, 1753, I was confidently sure; from the Nativity of Elizabeth Canning; that her Case was certainly true; from two Directions that came up at that Time; one the Midheaven to the Square Moon; Lilly 676. viz. it produces the Disesteem of the Commonalty, Thwarting and Contention; by base and unworthy Women; lost of Honour; it produces the Sentence of some Magistrate or Judge against them, &c. the other the Moon to the Opposition of Saturn; he is Lord of horrible Misrule and tragical Mischief; all Manner of Mischief that can be devised; divers Positions concur, to the like Effect, so as to prove it a Truth beyond Contradiction, testified by Numbers of the most learn'd Men from Experience in all Ages; from the Application of Mars to Jupiter the 30th Day of this Month; who is esteem'd the Worker of Justice;

I verily believe, and doubt not, that Elizabeth Canning will by then be freed from all the Dangers she labours under.

"JOHN HARMAN, Watchmaker, Bloomsbury."

When Dresden was taken in 1757 by the Prussians, the immense wardrobe of Count Bruhl, the Saxon minister, was found to contain a different habit, with its appendages of watch, stick, and snuff-box, for every day in the year.

Charles III. of Spain, who commenced his reign in 1759, established in New Castile a mechanical school, of which the avowed object was to form eminent proficients in the useful arts of dialling and watchmaking; but a writer in 1809 tells us that up to that time it had not produced a single pupil. At the King's College at Madrid was also a school for mechanics, in which the pupils were particularly initiated into the mysteries of watchmaking, and early in the present century this institution was under the superintendence of the brothers Charost. However, the mechanical arts have never been held in high estimation in Spain, and when pursued there have not obtained much success. We do not find that it has ever supplied any important horological mechanisms.

In the South Kensington Museum is a minute watch in the form of an apple, in a gold enamelled case, surrounded by a belt of seed-pearls. The stem or handle is in gold filigree work. It is of Geneva manufacture, about 1760. It was purchased for 7*l.* 14*s.*

We read in the 'Gentleman's Magazine' for 1762, under date May 29th, that "Mr. Peyton, dry fishmonger, opposite the water house, London Bridge, received by the Chester stage-coach a parcel, carriage paid; this when opened appeared to contain a gold watch in a shagreen case, with a gold chain and a red cornelian seal set in gold, which had been given to his wife

by her father, and had been lost between eight and nine years ago from her bedside. Immediately after the losing it Mr. Peyton made use of all the common methods of endeavouring to recover it (by advertisements, hand-bills, &c.), but to no purpose; till at length he had it in this manner most unexpectedly restored to him very safe, and without seeming to have met with any injury during the whole time it was missing."

One of the Lords Aston, of Forfar, was a watchmaker in 1763; and it is said that the Earl of Cottenham descended from John Pepys, citizen and clockmaker of London.

At a meeting of the Archæological Institute, held on July 3rd, 1863, the Earl of Mansfield exhibited several exquisite miniatures upon watch-cases of the last century. Among these paintings were portraits of the unfortunate Queen of Denmark, Caroline, sister of George III., and of the famous Struensee, Prime Minister of Denmark, who was executed in 1772 for an intrigue with the queen.

On June 4th, 1764, the celebrated watchmaker, Arnold, of Devereux Court, in the Strand, presented to George III. a curious Lilliputian repeating-watch of his own manufacture, set in a ring. The size of the article did not exceed that of a silver twopenny piece. It contained one hundred and twenty different parts, but altogether weighed not more than five pennyweights seven grains and three-fourths, which were thus minutely subdivided:—The movement complete weighed two pennyweights two grains and one-eighth; the great wheel and fusee, two grains and three-fourths; the second wheel and pinion, three-fourths of a grain; the barrel and mainspring, three grains and a half; the third wheel and pinion, the ninth part of a grain;

the fourth wheel and pinion, the tenth part of a grain; the cylinder wheel and pinion, the tenth part of a grain; the balance, pendulum, cylinder, spring, and collet, two-thirds of a grain; the pendulum spring, the three hundredth part of a grain; the chain, one-half of a grain; the barrel and mainspring, one grain and three-fourths; the great wheel and ratchet, one grain; the second wheel and pinion, the seventh part of a grain; the third wheel and pinion, one-eighth part of a grain; the fourth wheel and pinion, the ninth part of a grain; the fly-wheel and pinion, the seventeenth part of a grain; the fly-pinion, the twentieth part of a grain; the hour-hammer, half-a-grain; the quarter-hammer, half-a-grain; the rack-chain and pulley, one grain and a third; the quarter and half-quarter rack, two-thirds of a grain; the quarter and half-quarter snail and common pinion, two-thirds of a grain; the all-or-nothing piece, half-a-grain; the two motion-wheels, one grain; the steel dial-plate, with gold figures, three grains and a half; the hour snail and star, half-a-grain and one-sixteenth. For this delicate and exquisite specimen of art Arnold had to make nearly all the tools that he used in its manufacture. This tiny watch contained the first ruby cylinder ever made. The king was so pleased with this mechanical wonder, that he presented the donor of it with five hundred guineas as a recognition of his artistic skill. Some time after, the Emperor of Russia, having heard of the king's watch, offered Arnold one thousand guineas if he would make another like it for him. This Arnold refused to do, so that he might not depreciate the value of his gift, but allow it to remain unique. The 'Annual Register' for 1770, and the 'Gentleman's Magazine' for 1771, tell us that on

Christmas Day in the former year Mr. Arnold, a watchmaker in St. James's Street, presented to George III. a small repeating-watch in a ring, the cylinder of which was made of an Oriental ruby. Its diameter was the fifty-fourth part of an inch, its length the forty-seventh, and its weight the two-hundredth part of a grain.

Mr. S. Addington has a large oval watch, composed of two pieces of rock-crystal of octohedral form, three inches long and three inches wide. The dial shows the hours only; the bell is placed between the dial and the works. It was made at Lubeck, and is said to have belonged to Louis XIV. Lady Willoughby de Eresby has a gold watch, with a painted enamel back, and portraits of two children and a dog; with gilt chatelaine of chased figures and Louis XIV. scrolls. The maker was Augustin, of Vienna. Mr. J. G. Gardner has a gold watch, made by Graham, of London, the outer case being repoussé with Ulysses and Penelope and Louis XIV. scrolls.

In 1763 was published 'Mechanicus and Flaven; or, the Watch spiritualized,' by John Martin, watchmaker, of Spalding, Lincolnshire. The work purports to be a dialogue between the persons whose names give the title to it. The following extracts from it relate to the watch, the rest of the book being made up of religious reflections, which are more or less pertinent. The author afterwards was the pastor of a Baptist congregation in London; and he was the writer of numerous religious works.

Flaven proposes to discourse upon the watch, and its similitude to religious matters. Mechanicus consents, and they thus converse:—

Fla. First, then, let us consider the materials made use of.

Mec. Except the gilding, the whole is brass and steel; which, being but composition, reduces it to copper and iron.

Fla. Had we beheld the coarse and straggling particles, torn from the bowels of the earth, would it not amaze us to think of the strange revolution they must sustain ere they could possibly make the appearance they now do? . . . . . So, when this more noble structure, the human body, is well considered, &c. . . . . If we are surprised at the perfection of your watches, and that is increased by seeing it in the womb of the earth, how shall we express ourselves in consideration of this glorious display of the unlimited power of the Most High! . . . . . In what condition do you receive the watch at first?

Mec. I know not better how to inform you, than by saying all things are ruff'd out, yet everything is incompleat. The callipers drawn, but the distances of the holes throw some wheels too shallow, others too deep. The movements made, yet the wheels are rather forced than fitted in the frame. The motion is much the same; and even dial-plate, spring, chain, and every other article is more or less imperfect.

Fla. A lively representation of the case of man, as being a descendant of Adam. In this state, if I may be allowed the expression, all is but ruffed out, and nothing fitted for spiritual performance. . . . . Without a second birth (the finishing stroke) what are the works of any individual? You speak of wheels in this state being rather forced than fitted: so is it with them; all their doings proceed from slavish fear, not from love. . . . . If you added weight, would not that be sufficient to make it perform?

Mec. No; for meeting each other, no one will give

way, while the more substantial parts would crush the weaker to pieces.

Fla. Is it not thus with carnal men? Let your reproof be ever so weighty, it will be found unseasonable; and unless the Lord sets in, ineffectual. . . . . When finished, I suppose, these difficulties are removed.

Mec. Entirely: pivots are made, holes sized, wheels set of a proper depth, spring hooked in and adjusted, the verge finished, pendulum-spring put to, and the whole acts with much freedom and ease, and produces the lively motion you now see.

Fla. Thus when the Lord comes in a way of mercy, &c. . . . . the wheels of obedience are oil'd with love. . . . . Pray does not the main-spring take possession of that little box?

Mec. It does; and with it, the barrel arbour.

Fla. By this I understand, the watch is enabled to answer the purposes designed.

Mec. Your conceptions are very just: it is indeed with great propriety called the mainspring. The most elaborate performance without this were an useless toy: no longer than while it exerts its power, may we expect to receive any satisfaction for our labour.

Fla. What the mainspring is to the watch, that, and no more, is Christ to believers. . . .

Mec. That it is a hidden spring, may make it also applicable to Christ. . . .

Fla. In one instance more, let us pursue the similitude. It is an act of condescension for the mainspring to enter the barrel, is it not?

Mec. Why, if we have respect to its length, it does appear so.

Fla. But how does our Lord stoop, &c. . . . The barrel, in which the mainspring suffers itself to be contained may denote the human body. . . . . The barrel arbour, laying hold of the spring, may be descriptive of faith, which lays hold on Christ, &c. . .

Mec. The great wheel stands next in action. . . .

Fla. Is this the leading wheel? Methinks it is unfit for that office, it travels at so slow a rate. I should rather think it the pattern of slothfulness than industry, was it not contrary to proof: I should be inclined to think it stood still.

Mec. Its pace is quite consistent with its office; and when one considers to how many others it is connected, it remains not matter of surprise it moves so slow.

Fla. May not the certainty of its motion, yet in a measure insensibly, prefigure the second appearance of our Lord, when he comes without sin unto salvation? . . . . . I observe something to arise out of this wheel, in a conical form.

Mec. 'Tis the fusee, so formed, that the draft may be equal.

Fla. It almost shews forth then, tho' in silence, that gracious promise, "As thy day is, so shall thy strength be." . . . . . The chain I have always looked upon as curious.

Mec. It deserves your notice, and is undoubtedly a great improvement from gut, formerly used for the same purpose. The links though very diminutive are vastly strong, and, like valiant soldiers, will not easily be parted.

Fla. Wonderful indeed! but more glorious that chain of truths, mentioned by the apostle Paul, to the believing Romans. . . . . Neither is your chain alto-

gether so ornamental as that mentioned by Dr. Gill, which he supposes to be in the possession of every believer, though your links are more numerous. . . Ere we proceed any farther (you'll excuse my ignorance), I can't help observing the different strength of the wheels, and the various mixture of steel and brass. This wheel, that at present engages us, is strong and weighty, while that you call the balance-wheel seems hardly sufficient to sustain the shock it continually endures.

Mec. In proportion to the pressure upon them is the variety you see.

Fla. Were they to retain the same size and form, yet if all was steel, would not the watch, with the same usage, wear much longer?

Mec. Not an hour; for as a pinion of 6 moves in a wheel of 48 teeth, its work is much the harder, as it must go 8 times as fast, and so every leaf be almost upon constant wear, while a great part of the wheel enjoys a considerable rest.

Fla. Then I find each has according to his strength, and the business given him to do. So it is with us. . . . . The whole of the wheels, considered as performing various revolutions, yet all to bring about one end, seems descriptive of the wonders in Providence. . . . . The wheels being set of a proper depth, now, as you observe, move freely, and of themselves make no stoppages.

Mec. This reminds us of these poetical lines that run thus:—

> "Could but our tempers move like this machine,
> Not urg'd by passion, or delay'd by spleen." *

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* *Vide* page 321.

Fla. A small matter, free as they move, I imagine, would disconcert the whole, or occasion a full stop.

Mec. The smallest imaginable; a very thin hair would sooner effect it than you could walk across the room.

Fla. And wherein do we differ? Have I not seen the timorous Christian startle at his own shadow? . . . . . The continual tremor of the balance-wheel gives me pain to behold it; 'tis as tho' it was anxious to get forward, yet perpetually meets with disappointment.

Mec. It certainly would go at a very great rate, was it not for the verge, whose two pallats perpetually cross its endeavours.

Fla. Thus the new-born soul . . . . . and very considerable would soon be its progress, was it not for two things, viz. Satan and a wicked heart, which, like those pallats, continually thwart our intentions.

Mec. Well, henceforth, little wheel, I'll learn to pity thee, from a sensibility of my own condition.

Fla. And learn this also, to be incessantly labouring against them—they are of brittle metal, who knows but they may soon break? . . . .

Mec. Having now surveyed the principal parts of the movement, we will, if you please, ascend the upper story. . . . .

Fla. . . . In what a lively manner does the balance cross, yet it seems not to have its full play.

Mec. The balance is restrained, but in such a method as no ways infringes its liberty.*

Fla. There is something in that then like the fore-

* Every one acquainted with the acting of the pendulum-spring can easily explain this paradox; for though in some measure confined by it, it receives life from it.

knowledge of God; to whom tho' events be certain, yet it lays on us no co-active necessity to do this or that. . . . . The bars of the balance, if I'm not deceived, do not move round.

Mec. Nor yet one-half of the way; for ere it has measured that space, our little warrior * forces it back; which being met by the opposite tooth, keeps up the continual fray that a little while ago claimed our attention.

Fla. Methinks it is in a painful situation, not much unlike those frothy professors, who, notwithstanding all their bustle, are yet wanting of the root of the matter, moving but backward and forward, like the door on its hinges. The turning that little index makes my watch go faster or slower; but how it should have that effect I can't conceive.

Mec. It being joined to a steel wheel, the turning it moves a curb, which, according to the increase or decrease of the numbers, lengthens or shortens the pendulum-spring, and so abates or increases the watch's motion.

Fla. Thus when we turn our eyes upon ourselves, contemplate our unworthiness, and where the just demerit of the sin might long since have left us, it causes an abatement in our wonted vigour. . . . .

Here a request was made by Flaven to have the watch dissected; in which his friend being willing to gratify him, immediately complied. After spending a few moments in reflecting on its performance at half-time, it was soon taken to pieces. The number of holes in both plates soon commanded Flaven's notice, and being unable to know their use, caused him to say, "What irregularity is here! I can't help suspecting

* The balance-wheel.

that this must be the excursions of fancy, rather than the dictates of reason."

Mec. This is what I called the calliper, and the distances of the holes are now proper, as the opportunity we have had in seeing its performance confirm.

Fla. . . . . O thou gracious God . . . . . how often . . . . . have I dared to think thy ways were unequal . . . . Pray what is that little bit of steel, and what may be its use? which seems to have no communication to any part except the stud to which it is join'd, and a small spring that runs under it.

Mec. It's called the stop,* which by that spring is raised above the plate, to admit the cap of the fusee a free passage; but when the chain is almost drawn from off the barrel, it binds it down, prevents the person that winds up his watch from making too many turns, and secures it from many harms.

Fla. The dealing of God with his chosen people is much after this sort, and the unexpected meeting with that resistance has something of that sovereign authority that says to sinners, hitherto shalt thou come, and no further, and here shall thy proud waves be staid. Or if we respect the Lord's carriage to the wicked, it is somewhat similar, for, like the fusee, they run the round of several years without interruption; but when the chain of God's forbearance is almost at an end, or the measure of their sin filled up, a full stop is near at hand. . . . . By what name do you call that worm?

Mec. The endless screw. And if you'll please to observe its actings with that key, you will know with what propriety it is so called.

* Known in general by gardigut stop.

Flaven, on trying it, observes:—

Fla. My fruitless endeavours to accomplish what I imagined, at first view, would be soon done, reminds me of the delusive and frequent attempt of man seeking to be justified by the works of the law. . . . .

Flaven, here viewing the main pottance, discovered the banking pins; who desiring to be informed of their use and end, Mechanicus replied.

Mec. These prevent much confusion, and greatly contribute to the watch's regular performance; but for these, and upon every considerable shock, it would be disabled, the verge would overturn, and the balance-wheel be in danger of receiving much injury.

Fla. God's faithfulness and power thus keep his people. . . . . At present I'm engaged with viewing a movable piece of brass in this pottance, but know nothing of the necessity of its so doing, or what you call it.

Mec. 'Tis the dufftail, the small hole which receives the balance-wheel pivot; and its sliding gives an opportunity of placing the wheel to the best advantage, which can act nowhere but in one certain place, found by the dufftail's removal; the twentieth-part of an inch forward or backward would make it of none effect.

Fla. It would retain the name of a dufftail, I presume, tho' it answered not the end.

Mec. Undoubtedly; and as deservedly as some retain the name of men, tho' they act like brutes.

Fla. Thus, improperly some works are called good among men, that have the form, but are destitute of the end designed. . . . .

The motion next came under their inspection; when, after discoursing of its scanty room, and its hidden situation, the gilding of the plates, cock, and slide detained them.

See, said Flaven, what a great advantage this; every attempt to polish, how vastly inferior! The faded yellow those parts wear, serves but as a foil to set off the beauty of these; so, tho' man excel in moral acts, yet how vastly inferior to those who wear this garment of sanctification, which this gilding well prefigures; this is of a lasting nature, that of a short duration . . . . That bow of polish'd steel is, I think, the spring that confines the watch in the box.

Mec. The locking spring is for that use.

Fla. So should every particular church be "a spring shut up, a fountain seal'd." . . . .

Mec. But this spring knows no difference; it gives way to all, and freely lets every judge behold the infirmities within.

Fla. I'm sorry to say, the case with them is too similar; and that the weakness and failings of one another are as much exposed. As the gilding may prefigure the inward garment of sanctification, so the box, or more firm covering, the righteousness of Jesus Christ, which, as that shields the watch from injuries, so it shields the Christian from those bruises which otherways would be very fatal. . . . . The outside case may be descriptive of that happy government we enjoy under his present Majesty, King George III. . . . . But see, dear Friend, how insensibly has time stole away, and how soon have the shadows of the even come upon us; those hands that seemingly stand still, have made a long remove, and we're informed by yonder clock another hour's just gone.

Mec. How soon shall our place on earth know us no more?

The work from which we have made the above extracts, commences with the following "Verses sent to the Author from an unknown Friend:"—

"Believer, when beholding me,
An emblem of thyself here see.
My springs are hid from outward shew,
My beating pulse conceal'd from view,
And yet my face the hours disclose;
Th' effect appears, tho' hid the cause;
My work admitting no delay,
I constant serve thee, night and day.
So, Christian, let thy inward light,
Enjoy'd in Christ, appear in sight:
Let outward works to all proclaim
Thy faith unfeign'd in Jesus' name.
What God hath join'd let none divide;
No truth that's good its fruit can hide:
But let not works assume Christ's place;
Thou 'rt justify'd alone by grace:
Thus faith and works in love agree:
This lesson, Christian, learn of me."

Watches have on many occasions furnished topics for moralists. Besides the above gossip on horology and religion, we find that in 1783 was published 'The Disjointed Watch; or, Truth rent asunder and divided; a similitude, attempted in metre,' by Francis Okely, a learned and enthusiastic divine, who was born in 1718, and died at Bedford in 1794. In 1778 was published 'The Watch; an ode, humbly inscribed to the Right Hon. the Earl of M—f—d; to which is added the Genius of America, to General Carleton; an ode.' One of the books in Cowper's 'Task' is entitled 'The Time Piece.' It was written about 1783; but the name is a mere title to a reflective poem upon the topics of the day. In 1794 was published a book, entitled 'The Adventures of a Watch.' In 1861 appeared a little work, entitled, 'The Lay of the Clock, and other Poems,' which was written by a Lincolnshire carpenter, named Brown.

CHAPTER X.

Novel Watch presented to the King of France — Mrs. Abington's Watch — Almanac Watch — Madame du Barri's Watch — Two Watches worn at once — False Watches — Chinese and Dead Watches — Musical Watch — Chanting Watch — Legend of a Watch at Somerset House — Watch found in Northamptonshire — Fines on Watchmakers — Rousseau's Watch — London Watchmakers in 1781 — The Pedometer Watch — Ralph Gout — Watches in South Kensington Museum — Dr. Johnson's Watch — Lunardi's Watch, presented by George IV. — Watch found in a Shark — Watch referred to in one of Colman's Operas — Watch found at Leeds — Tale of a Sailor and his Watch — Watch in a Saddle — Perilous Feat with a Watch — Joe Grimaldi's Watch — Irish Giant's Watch — Lines on a Watch — Watch Anachronism — Norwegian Peasant's Watch — Talking Watch — Astronomical Watch presented to Emperor of Russia — Breguet — Napoleon I.'s Watches — Elegy and Eulogy on two Rival Watches — Transparent Watch — A Maker of Hours — Sultan Abdul Medschid's Watch — Watch Chain, &c., presented to Prince Albert — Lord Dudley Stuart's Polish Watch — Blind Watchmakers — Watches in the Great Exhibition of 1851 — The Rose Watch — Watches in the International Exhibition of 1862 — Jack Bailey's Watch — Watch bequeathed to Lord Palmerston — Watch in a Snuff-box — British Constitution compared with a Watch — The Chronograph.

THE 'Annual Register' for 1764 tells us that his most Christian Majesty the King of France had then lately been presented by M. Coupson, jun., a watchmaker of Paris, with a new watch of his invention, composed of five wheels like a common watch; but the maker had substituted for the barrel, the grand spring, the chain, and the fusee, a simple spring, which alone produced the effect as did those different pieces, and without the inconveniences attending them. It required no winding

up, but might be set in motion for twenty-four hours by a push, just as the striking springs of common repeating-watches were wound up.

Mrs. Abington, the celebrated actress, in the time of Garrick, although in receipt of a large salary, was frequently driven to the necessity of pledging her watch, which was a valuable one. The following note (the original of which is in the possession of Mr. John Bullock, of Sevenoaks, to whose kindness the author is indebted for this first public use of it) was written by her upon an occasion when she required a loan of thirty guineas, at half-past eight o'clock on the night of Saturday, November 16th, 1765:—"For Mr. Cates, next the corner of Round Court, Chandois Street. Sir, I beg the favour of you to send me thirty Guneas by the Bearer, and Let me Know if the Grate is Bought—Put the Money in the Box that the watch comes in and seal it up in paper, so that the person may not Know what she is come for. I am sir &c. F. Abington, Satarday night ½ after eight."

The 'Annual Register' for 1769 tells us of a curious almanac watch that was presented to George III. It was a kind of mechanical calendar, being designed merely to point out the months and days. It had a hand that was a year in making its revolution, and pointed to the month and the day of the month throughout the year. A second hand acted in the same manner as a regulator, by means of a pendulum, and was adapted to move or not at pleasure, without preventing the other parts of the work from going. The sun was represented by means of a brilliant on a plate, and regularly performed its diurnal revolution. On the plate was a movable horizon to show the variations of the days according to the seasons of the year. This watch,

although of complicated mechanism, was not larger than watches then in ordinary use.

On May 4th, 1860, the Rev. J. Beck exhibited at a meeting of the Archæological Institute a French gold watch, set with jargoons. On the back is an enamelled portrait in an oval wreath of small diamonds, surmounted by a royal crown. It was made by Lepine of Paris, and is traditionally said to have been given to Madame du Barri by Louis XV. about 1770, and was latterly in the possession of Sidney Lady Morgan. Mr. H. Munster has another gold watch by Lepine; it has a blue enamelled back, with male and female figures, diamond borders, and the motto "Souvenir d'Amitié." A white enamelled dial shows the hours, minutes, seconds, and the days of the week and month.

About the year 1770 it became the fashion among the dandies of that day to wear two watches, the chains and seals of which dangled on each side beneath their embroidered waistcoats. The supplement to the 'Universal Magazine' for 1777 gives us the following 'Receipt to make a Modern Fop,' in which two watches will be found named as part of the ingredients:—

"Two tuns of pride and impudence,
One scruple next of modesty and sense,
Two grains of truth, of falsehood and deceit,
And insincerity an hundred weight.
Infuse into the skull, of flashy wit
And empty nonsense, quantum sufficit.
To make the composition quite complete,
Throw in the appearance of a grand estate,
A lofty cane, a sword with silver hilt,
A ring, *two watches*, and a snuff-box gilt,
A gay effeminate embroider'd vest.
With suitable attire. Probatum est."

An anecdote is told of an Earl of Bridgewater, that

he, being near Windsor, was stopped by a footpad, who after robbing him of one watch, demanded the other. "Why do you suppose I have another?" asked his lordship. To which the thief replied, "I know it, for I observed you cross your hand to your left fob when you gave me this."

The foppery of wearing two watches was soon approved and adopted by the ladies; but it was found to be too expensive a fashion to wear two real watches, and accordingly a true watch was worn on the left side and a sham one on the right side of the person. The latter was called a *fausse montre*, or a dummy watch. The false watches were in some instances of gold and silver, and sometimes enriched with jewels and enamelled miniatures at the back. Some had in front a dial-plate, others a pincushion, and the most expensive ones had stars and devices set with stones, which were made to revolve by means of internal wheelwork. Those persons who did not go to the expense of such costly articles contented themselves with a dummy of gilt metal or of coloured foil. At a meeting of the British Archæological Association held on April 22nd, 1857, Mr. G. R. Corner exhibited an example of a *fausse montre*, one side of which was of silver thread and silk, and the other of golden-coloured fabric, and as both sides were of the same convex form, either might be worn outwards. It was one inch and seven-eighths in diameter, and one inch and one-eighth thick, and round the edge was sewed a chain made of the same materials as the rest, which was elongated into a loop at the top, and by which the ornament could be suspended from the girdle. When resting on the person of a well-dressed lady, this pseudo-timekeeper could scarcely have been distinguishable from a real watch. A *fausse montre*

of rich cloth decked the side of a belle at a court festival of George III., about the year 1770. It was made of a piece of the state costume of Lady Chapman, the wife of Sir John Chapman, who filled the office of Lord Mayor in the year 1689. The material was cloth of gold, brocaded with rosebuds of green and crimson velvet, and surrounded by a pendant from a chain-work of golden cord. At the present day a Chinese gentleman wears a pair of watches of European manufacture, one on each side of his girdle, in an embroidered pocket. If questioned as to the meaning of his seeming extravagance, his answer may be to this effect, "Suppose one make stop, the other walkee."

Very advantageous exchanges of watches are sometimes made by Europeans with the Chinese, many of whom ignorantly suppose that when a watch stops it is dead, and are glad to barter it away for a living one. This notion of a dead watch appears to have obtained currency in most barbarian countries. Baker, in his work on the 'Albert N' Yanza,' the great basin of the Nile, tells us that during his travels, commenced in 1861, a native named Kamrasi "produced a large silver chronometer that he had received from Speke. 'It was dead,' he said, 'and he wished me to repair it.' This I declared to be impossible. He then confessed to having explained its construction, and the cause of the 'ticking' to his people, by the aid of a needle, and that it had never ticked since that occasion."

The Sieur Ranzonet, a watchmaker of Nancy, in Lorraine, made in the year 1770 a watch of the common pocket size, in which he fixed an instrument of his own invention that played an air *en duo*. All the parts of this little musical mechanism were distributed with such art as not in the least to effect the movement of the

watch. It was also so nicely constructed as not to be influenced by either heat, cold, draught, or moisture.

During the reign of Catherine II. of Russia an ingenious Russian peasant, named Kulubin, constructed a musical repeating-watch to perform a single chant. The machine was about the size of an egg, within which was a representation of the tomb of Christ, with the Roman sentinels on watch. On pressing a spring the stone would be rolled from the tomb, the sentinels fall down, the angels appear, the holy women enter the sepulchre, and the same chant which is sung in the Greek Church on Easter-eve be accurately performed. This watch is now in the Academy of Sciences at St. Petersburg.

The celebrated Dr. Hawkesworth, who died in 1775, was brought up to the business of a watchmaker.

It is related that when Somerset House in the Strand was being built in 1776, a workman fell from the scaffolding, but was checked in his descent by his watch-chain catching to a projecting part of the wall or scaffolding; and to commemorate his wonderful escape he placed his watch in the face of the wall. A watch-face is to be seen on the south side of the quadrangle over the entrance to the old Stamps and Taxes Office; it was, however, fixed there during the first quarter of the present century as a meridian mark for a transit instrument in a window of the Royal Society's ante-room in the inner side of the north front of Somerset House.

About 1776 was found in Ketteringfield, Northamptonshire, a curious watch, which early in the present century was in the possession of Mr. W. Woolston of Adderbury. It was oval in shape, the case, which was silver gilt, being formed in an undulating manner similar to the rose on the old nobles. On the face was a small

circular silver dial-plate, ornamented with a landscape; and on the inner-plate was inscribed the name of the maker, "Chris de Welke."

The 'Annual Register' for 1777, the 'Gentleman's Magazine' for the same year, and Sir Richard Phillips, in his 'Chronology,' record that in December, 1777, was tried before Lord Mansfield in the Court of King's Bench a remarkable cause, the first of its kind, Cabrier against Anderson, in which the defendant was sued for putting the plaintiff's name to five watches made by the defendant, and thereby hurting the reputation of the plaintiff. A verdict was given for 100*l*., being 20*l*. for each watch, agreeable to an Act of Parliament of William III., inflicting a penalty on watchmakers who put fictitious names to their watches.

Jean Jacques Rousseau, who died in 1778, in his 'Emile,' livre iii., thus moralizes upon "la montre du sage:"—"Le temps perd pour nous sa mesure, quand nos passions veulent régler son cours à leur gré. La montre du sage est l'égalité d'humeur et la paix de l'âme; il est toujours à son heure, et il la connoît toujours." Rousseau's copper watch was sold in Paris after his death for five hundred francs.

According to Kent's 'Directory' there were in London in 1781 sixty-seven watch and clock makers, of whom the following is a list:—

Addis, William, 3, Birchin Lane.
Atkins, Francis, 35, Clement's Lane.
Atkins, Robert, 20, Salisbury Street, Strand.
Baird, John, 190, Strand.
Barton, John, 64, Red Lion Street, Clerkenwell.
Berridge, William, Clock and Watch Maker, 69, Oxford Road.
Bidlake, James, Clock and Watch Maker, 31, Minories.
Bingham, Thomas, Watch Chain Maker, 3, Middle Row, Holborn.

Blundy, Joseph, Clock and Watch Maker, 21, St. John Street, Clerkenwell.

Brockbank, John, Clock and Watch Maker, 6, Cowper's Court, Cornhill.

Bryant and Son, Clock and Watch Makers, 47, Threadneedle Street.

Cabrier and Leekey, 15, Basinghall Street.

Carrington, Richard, 22, Old Bethlem.

Chartier, Isaac, 1, Angel Court, Throgmorton Street.

Chater, Eliezer, 10, Exchange Alley, Cornhill.

Chater, James, 3, Cherry Tree Court, Aldersgate Street, and 14, Cornhill.

Conden, Robert, 51, Clerkenwell Close.

De St. Leu, Daniel, Watchmaker to Her Majesty, 17, Cloak Lane, College Hill.

Devis, John, 76, Lamb's Conduit Street.

Ellicot, John, and Son, 17, Sweeting's Alley, Cornhill.

Evans, James, 7, Sweeting's Alley.

Farran, Robert, Watch Chain Maker, 9, Middle Moorfields.

Fitter, Thomason, 37, St. John Square, Clerkenwell.

Fladgate, John, Conduit Street, Hanover Square.

Fleetwood, Robert, 33, Abchurch Lane.

Fox, Isaac, 39, Minories.

Gout, Ralph, 6, Norman Street, Old Street.

Gray, Adam, 5, Berkeley Street, Clerkenwell.

Green, James, 5, Fenchurch Street.

Hardy, John, 8, Bridgewater Square, Barbican.

Hitchin, Joseph, 4, Brown's Buildings, St. Mary Axe.

Holmes, John, near Somerset House, Strand.

Howard, Edward, 6, Great Kirby Street, Hatton Garden.

Hunter, Thomas, junior, 156, Fenchurch Street.

Jackson, John, and Co., 2, Bridgewater Square, Barbican.

Jessop, Josias, 38, Southampton Street, Covent Garden.

Lamb and Webb, 21, St. John's Square, Clerkenwell.

M'Cabe, James, 11, Bell's Buildings, Fleet Street.

Maclennan, Kenneth, May's Buildings, St. Martin's Lane.

Martin, Thomas, 27, Cornhill.

Martineau, Joseph, St. Martin's Court, Leicester Square.

Mason, William, Dockhead, Southwark.

Mitchelson, Walter, 3, Helmet Row, St. Luke's.

Norton, Eardley, 49, St. John Street, Clerkenwell.

Peacock, George, 4, Sweeting's Alley, Cornhill.

Philp, Musical Clockmaker, 6, New Court, St. John Street, Clerkenwell.
Prigg and Ansell, Clock and Watch Spring Makers, and Steel Manufacturers, Middle Moorfields.
Prior, George, 3, Prescot Street, Goodman's Fields.
Rigby, Joshua, 5, Berkley Street, Clerkenwell.
Rimbault, Paul, Clockmaker, 9, Denmark Street, St. Giles's.
Rogers, Isaac, 44, White Hart Court, Gracechurch Street.
Rose, Joseph, and Son, 17, Foster Lane.
Sanderson, Henry, 301, Strand.
Scott, John, 40, Gloucester Street, Red Lion Square.
Sidey, Benjamin, 5, Moorfields.
Spencer and Perkins, 44, Snow Hill.
Stuk, William, Cockspur Street.
Strigel, George Philip, Stafford Row, near Buckingham Gate.
Thompson, John, 10, Red Lion Street, Clerkenwell.
Tutet, Edward, 10, Fenchurch Street.
Twyford, Robert, 40, Strand.
Vale, William, 12, Bunhill Row.
Underwood, Robert, 3, Falcon Street, Aldersgate Street.
Upjohn, James, and Co., 12, Red Lion Street, Clerkenwell.
Webster and Son, 11, Change Alley.
Wicksteed, 114, Bunhill Row.
Willshire, James, 19, High Holborn.

Ralph Gout, one of the watchmakers above named, was the patentee of a watch in which time and measure were united. An engraving now before us gives two representations of this watch. The dial-plate of No. 1 has upon it four small circles of figures besides the ordinary circle on the outer edge. The divisions on this latter circle, however, indicate every thousand steps to the amount of sixty thousand. One long hand points to them. The hours and minutes are shown by two hands on one of the four small circles at the top of the dial-plate. The divisions on the small circle to the right show every step taken to the amount of ten. The divisions on the small circle in the middle every ten steps to the amount of one hundred. The divi-

sions on the small circle to the left every hundred steps to the amount of one thousand. The dial-plate of No. 2 has upon it three small circles of figures besides the ordinary circle on the outer edge. The divisions on this circle indicate every hundred steps to the amount of ten thousand. The hours and minutes are shown as on the other dial. The divisions on the small circle to the right show every step to the amount of ten. The divisions on the small circle to the left every ten steps to the amount of one hundred. In the South Kensington Museum are a gold watch and pedometer combined, in an enamelled and chased case. The diameter of the watch is two inches and a quarter, and the length of the case is eight inches and seven-eighths. This instrument is by Ralph Gout; and it was purchased for 20*l.* 10*s.*

In the same museum is a watch in blue enamel, set with paste diamonds; the diameter being one inch and seven-eighths. It is of French manufacture, and the date is about 1780–90. It was purchased for 3*l.* 3*s.* 2*d.* Also a watch in a heart-shaped gold locket-case, which is enriched with arabesques in champ-levé enamels. The maker's name is Constantin, of Geneva. This watch is of the eighteenth century; its height is one inch and three quarters, its width one inch and a quarter; and it was purchased at the Bernal sale for 5*l.* 5*s.* Also a watch-case of gold, enamelled with classical figures in camaieu on a brown ground. It is of the eighteenth century; its diameter is one inch and three quarters; and it was purchased for 4*l.* 10*s.* Also a watch in a plain silver case, which was presented by the Rev. R. Brooke, of Gateforth House, Selby. The maker's name is Thomas Johnson, of Richmond; the date is the eighteenth century; and the diameter of the

outer case is two inches. Also a watch in a plain silver case, of the eighteenth century, the maker's name being Robert Henderson, of Scarborough. The diameter of the outer case is one inch and three quarters. Also a watch in a plain silver case, of the same date, the maker's name being Henry Hindley, of York. The diameter of the outer case is two inches. Also a repeating-watch in pierced gold, the case being of shagreen ornamented with piqué dots. The maker's name is James Charwell, of London; the date is the eighteenth century; and the diameter of the outer case is two inches. These watches also were presented by the Rev. R. Brooke.

Lady Fellows has the following watches of the eighteenth century. A round metal-gilt watch, with chased back of Venus and Cupid. The dial-plate has the numerals inserted in white enamel. The maker was Josue Panier à Paris. A gilt plain watch, with siver engraved wreath round the side. The maker was J. Bock. A round silver alarum repeater-watch, with open side, and a silver chain, three seals, and two keys attached. The maker was Henry Gebhart à Strasbourg. A round silver watch, with white and blue enamelled dial. The maker was Pierre Duet. A round silver repeater-watch, with open gilt sides, and a silver ring with numerals on the dial-plate. The maker was Boekelts, Hagh. A round silver watch, chased with flowers, having a silver dial-plate, and two circular dials, showing the hour, the age of the moon, and the days of the week and month. The maker was Louis Arthaud à Lyon. A round silver watch, with silver dial, and gilt open work. The maker was Heinrich Carstens, Lubeck. A round silver watch, showing the hour and the day of the month. The maker was John Spence, of London. A round silver-gilt alarum repeater-watch,

with gilt dial-plate, showing the hour and the day of the month; and a pierced floriated back. The maker was Shelton. A round silver watch, engraved with a basket of fruit and birds; and having a silver dial, showing the hour and the days of the month. The maker was John Smeaton, of York.

The following watches of the eighteenth century are now in the possession of their owners undermentioned—Sir W. Lawson, Bart., has a silver watch by Jackson, in an outer case of tortoise-shell, piqué with silver, the silver dial showing the hour and the days of the month. Mr. J. Rainey has a melon-shaped watch, made by Amalric Frères, ornamented with blue enamel, semée with gold stars, the stalk forming the handle; it is one inch and a quarter in diameter; attached is a gold leaf-shaped key. Also a small gold shield watch, by Singleton, of Paris, set round with pearls, with two dials, one showing the hour, and the other the balance-wheel. On the back is a painted enamel bouquet of flowers. It is one inch and a half in diameter. Mr. H. Munster has a French gold watch, with white enamelled dial, the back being of blue enamel, with gold ornaments. Also a French gold watch, with a gold face, pearl borders, green enamelled back, and a painting of a boy with a mousetrap and a dog. Also a gold watch enamelled in imitation of an apple, with green leaves, edged with pearls. Messrs. Hunt and Roskell have a gold watch by Emery, of London, with a painted enamel case of the Holy Family, and a landscape inside. Mr. J. G. Gardner has a gold watch by Richard French, chased with flowers and a painting on the back in the Watteau style of children catching birds. The bezel is set round with diamonds; the bow and hands also are set with diamonds. It has an outer case. Mr. H. W. Sass has

an enamelled gold watch by Fitter, of London, with a painted female figure holding a caduceus; at her feet are a cornucopia and flags. Miss Bentinck has a small enamelled gold French watch, painted at the back with amorini playing with a goat.

The watch, teapot, and punch-bowl of Dr. Samuel Johnson, who died in 1784, are still reverently preserved by their owners from crack or flaw. His ink-stand is in the possession of Dr. Robert Bigsby, of Peckham.

Lunardi, an attaché to the Neapolitan embassy, made the first aerial ascent in England from the Artillery Ground, Finsbury, in September, 1784. Upon which occasion the Prince of Wales, afterwards George IV., presented him with a gold watch, as a token of his admiration of what appeared at that time to be a most wonderful experiment. In making another ascent from Naples some time afterwards, about 1802, Lunardi fell into the sea, and the watch was much injured. He then petitioned the prince to order it to be repaired. The following is a copy of the petition, the original of which is in the possession of Mr. John Bullock, of Sevenoaks, by whose kindness the author is enabled now to publish a transcript of it. The petition is entirely in the autograph of Lunardi, and was endorsed by him as follows:—"To His Royal Highness George Prince of Wales. The most respectful Petition of Vincent Lunardi, first aerial Traveller in England." "To His Royal Highness George Prince of Wales. The mos Respectful Petition of Vincent Lunardi. Humbly sheweth, That Your Royal Highness's Petitioner soon after his ascent from the Artillery Grownd, & Aerial Voyage, receiv'd a valuable Stop-Watch describing seconds, as a token of Your Royal Highness's approbation, with a command that, it should be Your

Petitioner companion on every future aerial excurtions, which has ever been implicitly obeyed. And Your Highness's Petitioner begs leave to represent, that after ascending with His Balloon from Naples he was unfortunately obliged to descend in the Gulf and being dragged throgh the waves for three hours, he was landed at the Island of Capri, where on recovering from the fatigue of his unpleasant aquatic jurney he found his valuable Watch so much injured by the Salt Water, that the exertions of a very ingenious artist were required to render it once more useful, but in Italy neither Love or money could procure that assistance. Your Royal Highness's Petitioner therefore humbly solicits that Your Highness will be graciously pleased, to direct Mr. Villiamy to renew the internal part of the Watch, so that, he may enjoy its aid on his next flight, which will shortely take place at Coruna while the British Fleet is off Ferrol, and Your Royal Highness's Petitioner will continue, as has been his uniform practice to offer up his prayers, especially when he has ascended nearest Heaven, to Almighty God for the Precious Health and Long Life of Your Royal Highness." This petition was sent by Lunardi to Vulliamy, of Pall Mall, the prince's watchmaker, in a letter, of which the following is a copy:— "Mr. Villiamy, His Royal Highness's Prince of Wales Watchmaker Pall Mall. Mr. Lunardi presents his respectful compliments to Mr. Villiamy, he has been very ill with a colic and seemes it will not be in his power not to walk out to Day therefore, as he understand His Royal Highness is to leave Town this afternoon, Mr. L. begs Mr. Williamy will waite on His Royal Highness with the inclos'd. Thursday morning 9 o'clock. No. 13, Oxendon Street, Haymarket."

In 1785 died Peter Roy, who was watchmaker to the King of France. He was the author of the Memoirs for the Clockmakers of Paris, entitled 'Etrennes Chronometriques.' Julien le Roy, a relation of this mechanician, was a famous French watchmaker, of whose reputation his brother artists in Paris were jealous, and they did what they could to imitate him. J. B. Baillon, the queen's horologer, tried to outdo him, and he made all sorts of whimsical clocks and watches, adding toys to them as the fashions of the court required change. This man died young, and probably the richest clock and watch maker in Europe.

Sir Richard Phillips tells us in his 'Chronology' that in 1787, a shark was taken in the Thames near Poplar, and in its belly was found a watch, with the name of Watson engraved upon it. It belonged to a young gentleman who had been drowned near Falmouth.

In Colman's opera of 'Inkle and Yarico,' first played in 1787, Sir Christopher Curry sings:—

> "Complaisance is a gingerbread creature,
> Us'd for shew, like a watch, by each spark;
> But truth is a golden repeater,
> That sets a man right in the dark."

In 1788 was published an etching in folio, by J. Nixon, of James Davis, a lunatic at Margate, who died in 1790. He is represented whole-length, with a leek in his hat. He was brought up as a watchmaker, and afterwards became sexton of St. Bride's, London.

In March, 1788, a gold watch was found upon an open common in the neighbourhood of Leeds. It had been lost by a gentleman when fox-hunting about sixteen years before.

During the war of 1796 a sailor went to a Mr. Mac Laren, a watchmaker, and, presenting a small

French watch to him, demanded to know how much the repair of it would come to. Mr. Mac Laren, after examining it, said, "It will be more expense repairing than its original cost." "I don't mind that," said the sailor; "I will even give you double the original cost; for I have a veneration for the watch." "What might you have given for it?" said the watchmaker. "I gave a fellow a blow on the head for it; and if you repair it I will give you two."

Early in the present century was to be seen in the stables of the Elector of Saxony a watch fitted in the pommel of his saddle.

At the commencement of the same century, a watch was cleaned on the summit of Salisbury spire. From time to time some daring person has climbed this spire to oil the weather-cock, a most dangerous feat, as the top of the spire is four hundred and four feet from the ground. It is ascended by ladders for about three-fourths of its height, which are fixed inside the spire. A small door then opens, and the adventurer has to climb the rest of the way by a series of irons, something like the handles of flat-irons, which are fixed in the stonework, and by which he is able to make his way to the top to complete his dizzy work. On an occasion some persons were assembled at the 'Pheasant,' in Salisbury; and were talking about this feat, when a watchmaker, named Arnold, who was present, offered for a small wager to ascend the spire; to take with him his tools and a watch; to take the watch to pieces on the very top of the spire; to clean it properly; and to bring it down in less than an hour. He accordingly climbed the spire, fixed his back against the stem of the weather-cock, completed his task, and descended within the given time.

In the season of 1806–7 the admirers of the performance of Joe Grimaldi, the clown, at Sadler's Wells Theatre, presented him with a handsome watch, the face of which was so contrived as to represent a portrait of himself in the act of singing his romantic ditty of 'Me and My Neddy.' In 1809 two highwaymen, who knew Grimaldi, robbed him of this watch and other articles, on Highgate Hill. One of the thieves, however, induced his companion to restore the watch, which they valued at only two pounds, to its owner on the spot.

The gold watch of Patrick Cotter *alias* O'Brien, the Irish giant, who was born in 1761, and died about 1808, is still in use, and keeps time as well as ever. It is of unusual size, its works are of extraordinary strength, and it weighs a pound, with the chain and seals. It is a chronometer and repeater, and was made large and suitable for its huge owner. It has his name engraved on the cap, thus:—"Patrick Cotter, Kinsale, Ireland." It was purchased by the father of the present possessor at a sale after the giant's death.

In the 'Gentleman's Magazine' for 1809 are the following lines, "On seeing a French watch round the neck of a beautiful young woman:"—

> "Mark what we gain from foreign lands,
> Time cannot now be said to linger,
> Allow'd to lay his two rude hands,
> Where others dare not lay a finger!"

These identical lines also appear in the same magazine for 1811, probably being reproduced by mistake. In neither instance does the author's name appear; but in 'Arlis's Pocket Magazine' for 1818 we find them figuring under the initials of A.R., as an epigram on

seeing a French watch suspended upon the breast of a young lady. A. R. does not, however, acknowledge his indebtedness to the 'Gentleman's Magazine.'

A writer in 1809 tells us that shortly after Easter in every year the baptism of St. Vincent Ferrier was portrayed in the church of St. Stephen at Valencia, by twenty statues or puppets as large as life, representing the priests, clerk, godmother, midwife, servants, and others. An amusing anachronism was displayed in this religious exhibition, for the women-figures were fully dressed in the then French style, with watch-chains among other personal decorations. St. Vincent was born in 1357, and died in 1419, dates long antecedent to the time of the invention of watches.

In the burlesque opera of 'Bombastes Furioso,' by Rhodes, first performed in 1810, the great general Bombastes tells the king—

> "Thrashed are your foes—this watch and silken string,
> Worn by their chief, I as a trophy bring;
> I knock'd him down, then snatch'd it from his fob:
> 'Watch, watch,' he cried when I had done the job:
> 'My watch is gone,' says he; says I, 'Just so;
> 'Stop where you are—watches were made to *go*.'"

The Norwegian peasants are remarkable for ingenuity, industry, and mechanical genius. J. B. Depping, writing in 1817, says, "A lady of the Danish court one day showed me, in a company where we met, a beautiful repeater which she wore. Everybody admired the workmanship, though it was observed not to be so highly finished as the best performances of the watchmakers of London and Paris; but we were all not a little surprised when she informed us that this watch was made by a young Norwegian who had never learned the trade, or been from home: that before he could

set about this arduous task, he had been obliged to make, with his rude implements, such fine tools as he wanted; and that in three years he had at length completed this beautiful piece of work, which for solidity and regularity was not surpassed by any other of the kind."

According to the 'Gentleman's Magazine' for 1820, an artist at Cemberg, in Prussia, about that year constructed a talking-watch, which imitated the human voice, and answered questions in German and Polish, besides executing musical airs.

The 'Annual Register' for 1821 tells us that M. Kuhaiewsky, of Warsaw, had then lately produced as his invention an astronomical watch, which indicated the difference of time in the principal places in various parts of the globe. It had been accepted as a present by the Emperor Alexander, who had sent M. Kuhaiewsky in return a magnificent snuff-box, and assigned him a sum to enable him to continue his important scientific labours.

About the middle of Denzil Street, on the south side, lived in 1829 Theophilus Holdred, a jobbing watchmaker, whose name will always hold a place in one department of mathematical history. He discovered a method of approximating to the roots of numerical equations, of considerable ingenuity. Further particulars of him will be found in 'Notes and Queries' for 1850.

Brequet was a celebrated French watchmaker, who flourished at the end of the last, and the commencement of the present, century. He was greatly encouraged by the Allies in 1815. The Emperor Alexander purchased several of his unequalled watches, and the Duke of Wellington had one of them, which on touch-

ing a spring at any time struck the hour and minute. It cost him three hundred guineas; he carried it for many years, and it proved of great service to him on many occasions. The Duke and Duchess of Berri, the Marquis of Londonderry, Lords Beauchamp, Chesterfield, Bruce, and many others were also customers of Brequet, who was without doubt the best and most scientific watchmaker of his age. He was not an advocate for flat watches, as he said they impeded the proper action of the wheels, and could not be depended upon as time-keepers. The prices that he paid to his best workmen were enormous, there being few to whom he could entrust his watches, as so many were drunkards and could work only a day or two in the week. Captain Gronow, in his 'Recollections,' says that Brequet told him that he paid some of his artificers thirty francs a day, and none less than a napoleon, and that through Paris there were only fifteen or twenty able to execute the delicate work necessary for such watches as he made. He was a great encourager of merit, and used to say to his young workmen, "Do not be discouraged, or allow a failure to dishearten you." Brequet, besides his scientific knowledge and mechanical skill, possessed much general information. Napoleon himself, knowing his abilities, frequently went incognito to his workshop, and conversed upon the improvements he was anxious to effect in cannon and firearms.

Napoleon I. had a watch which wound itself up by means of a weighted lever, which at every step that he made rose and fell; and, having a gathering click to it, wound up a ratchet attached to the barrel, if it were not then fully wound up. The instrument called the pedometer, which is not larger than a common watch, is on the same principle; its use being to register the

number of steps taken by the wearer while the instrument is in his pocket. It is capable of adjustment according to the number of steps the wearer usually takes in a mile, which he must first count, and set the instrument accordingly. Without such adjustment it does not form any measure of distance.

In Madame Tussaud and Sons' Exhibition, London, is a gold repeating-watch of considerable value, which was presented by Napoleon Bonaparte to Mr. Mati, his valet, who accompanied him in his Russian campaign. The valet declared it to have been presented to him on leaving the Emperor's service after the battle of Leipzig. He sold it to William Bullock, of the Egyptian Hall, Piccadilly, who afterwards sold it for the same price as that which he had given for it to M. Tussaud. The same Exhibition contains a singular secret clock, containing a small figure of Napoleon, which was formerly the property of his brother Lucien.

In an engraving published in 1830 Death enters a watchmaker's shop, and shows his hour-glass to the master, saying, "Vais-je bien?" To which the latter answered, "Vous avancez horriblement."

Babbage in his 'Economy of Manufactures,' 1835, says:—"An apparatus has recently been applied to watches, by which the hand which indicates seconds leaves a small dot of ink on the dial-plate whenever a certain stop or indent is pushed in. Thus, whilst the eye is attentively fixed on the phenomenon to be observed, the finger registers on the face of the watch-dial the commencement and the end of its appearance."

In the 'Mirror' for 1837 appear certain flimsy rhymes, entitled 'Elegy and Eulogy on two Rival Watches,' which commence thus:—

"Here *lieth* one whose chief besetting sin
Was *lying*, tho' he'd neither tongue nor chin;*
Consummate falsehood bubbl'd, without rest,
From *springs*, all lying 'neath his brassy breast.
That one who had no tongue from truth should swerve
Sounds somewhat strange—but who has fail'd t' observe
That words, tho' true, may be in fact a lie,
As falsehoods may be uttered guiltlessly;
Whate'er is said, whate'er one may believe,
Lying is but th' intention to deceive."

In the year 1839 a transparent watch of small size, constructed principally of rock-crystal, was presented to the Academy of Science at Paris. It was made by M. Rebellier. The works were all visible; the two teethed wheels which carried the hands were of rock-crystal, and the other wheels were of metal. All the screws were fixed in crystal, and each axis turned on rubies. The escapement was of sapphire, the balance-wheel of rock-crystal, and the springs of gold. This watch was found to keep excellent time, which circumstance was attributed by the maker to the feeble expansion of the crystal in the balance-wheel.

A traveller, writing in 1844, says, "I saw to-day in Munich, above the door of a watchmaker's shop, the words Uhr Maker, a Maker of Hours."

In 1844 Messrs. Hart and Son, of Cornhill, made for the Sultan Abdul Medschid, a watch, which as a whole was perhaps the most costly and elaborate piece of horological mechanism ever produced by English workmen up to that time. It was exhibited to the Queen and to Prince Albert as a triumph of British skill and taste. The watch was five inches in diameter; it was in a double case of twenty-two carat gold; the back external case was beautifully enamelled with

* "The lower part of his face was effaced."

flowers, within a border of arabesque scroll-work. This part of the workmanship was truly exquisite, the brilliancy of the colours and the delicacy of the pencilling surpassing anything of the kind of foreign manufacture. The dial was white opaque, enamelled on copper, similar to English watches in general; but the figures were Turkish characters. The hands were of blue steel, set with diamonds; one hand represented a dart, and the other a shorter dart, or arrow, with the crescent at one end. The movement was duplex, with a chronometer-balance, and jewelled in ten ruby holes. The watch struck the hours and quarters by itself, as the time represented; which striking was repeated, together with the minutes, by pushing upwards a small gold slide. The inner bottom was of crystal, so as to show the repeating mechanism; and through the crystal were two holes, to wind up the striking part and the movement. Wires, instead of the old method, by a bell, were used; and the sound resembled that of a powerful and harmonious cathedral clock. The pendant, or handle, was formed of five scrolls, shaped piramidically, and beautifully engraved. The cost of this watch and a companion one, which were both ordered in 1843 through the Turkish embassy, was one thousand two hundred guineas.

In 1845, the operatives of Birmingham, with a view to stimulate the manufacture of British jewellery, presented to Prince Albert, with other articles for the Queen, a watch-chain, seal, and key. The design of the seal was the Warwick vase, standing on a pedestal, supported by Mercury and Ceres; grapes sprung from the top of the seal, the tendrils of the vine gracefully forming the loop. The key was in tasteful keeping with the seal; the vine and the oak were represented as

springing from the same soil, the foliage of each being perfectly developed. A pendant acorn chastely formed the termination of the hanging foliage in the centre of the key.

In 1847 the Polish emigrants in Great Britain and Ireland presented to Lord Dudley Stuart a gold watch, as a token of gratitude on the part of the whole Polish emigration in all countries of the world, for the services rendered by him to the cause of their nation. This watch, which was made by Messrs. Patek and Co., Poles, established at Geneva, had a chronometer escapement, with compensation balance and isochronal spiral spring, its principal parts being garnished with rubies. It was wound up, and the hands could be set without any key, according to a very simple and ingenious contrivance invented by the manufacturers. It was a repeater; it marked the seconds, and on its pendant was constructed a small mariner's compass. The dial represented in basso-relievo the last seal of independent Poland, exquisitely engraved. In the centre was the white eagle, of which the red escutcheon was supported by two upright figures, the emblems of Justice and Peace. Around, instead of ciphers indicating the hours, were the arms of the eleven principal provinces of ancient Poland on palm-branches, twelve o'clock being marked by the cross which surmounted the royal crown. All this allegory was well adapted to the occasion. At each hour one separate and distinct province, surrounded with a martyr's palm, recalled itself to the remembrance of the defender of the Polish cause. Justice and Peace appeared as if pleading in its behalf, and the cross which crowned the whole seemed to remind sovereigns and nations of their relative duties. The compass was intended to direct attention constantly to the north, and

the striking of each hour was an imitation of the alarm-bell of Poland. On the back of the watch was carved in alto-relievo the coat-of-arms of the Stuart family projecting from a rich damask ground, which covered the whole watch. In the middle of the inside case was this inscription: "Nobili Domino Dudley Coutts Stuart, Illi Assiduo Libertatis Poloniæ Defensori, Ejusque Filiorum Patria Orborum Adpitori. Die 3 Maii, 1847."

The 'Illustrated London News' of August 23rd, 1851, tells us that there was then living at Holbeach, Lincolnshire, a watchmaker named Rippin, who was completely blind. He was a first-rate hand at his business, and it was truly surprising to observe with what ease he could take to pieces and place together again watches of the most delicate mechanism. Some years previously Rippin was robbed, and the property taken from him consisted of watch-wheels, hair-springs, and other tiny things belonging to the trade. The thief was traced, and convicted at Spalding sessions, the blind man having sworn to his property by feeling. Early in the present century, at Barnstaple, was a sign over a door, denoting that clocks and watches were repaired by William Huntley, a blind man. He was born blind, and was brought up by his father, who was a clock and watch maker, to that business, which he afterwards followed. He had plenty of employment, being considered by the inhabitants to be very efficient in his profession. He repaired musical clocks and watches, and seldom met with any difficulty in repairing the most complicated. It often occurred that in cases where others had failed in completely restoring the defective work of a clock or watch, this man discovered and set right the defect.

The Great Exhibition of 1851 contained numerous curious watches. Messrs. Rotherham and Sons, of Coventry, whose establishment was the only one of the kind in England in which machinery impelled by steam-power was employed for performing many of the processes in the completion of a watch, exhibited the various parts of a lever watch in the progressive stages of manufacture; for instance, the top plates, pillar-plate and cap, cap-spring cock, name-bar, potence, wheel-bar, regulator, pendulum, stud, detent, detent-spring, stop, stop-spring, index, bolt, bolt-spring, dial-wheel, click and ratchet chain, barrel-cover, barrel-arbor, fusee, collet, main or great wheel, maintaining-power spring, maintaining-power wheel, fusee, roller, lever pallet, escape wheel and pinion, third wheel and pinion, centre wheel and pinion, compensation-balance, pendulum-springs, ruby stones, jewel holes, cases, and rings for glasses. All the above were shown as roughly cast, then as formed into proper shapes, and lastly, as finished. Several movements were also shown, and a beautiful display of one hundred and thirty-seven watches of all kinds, from the plainest silver watch to the most elaborately finished and ornamental gold watch.

Mr. Thompson exhibited his auto-chronograph, for the instantaneous stamping or printing of time.

Mr. Dent, in addition to the large turret-clock in the nave, had a good display of chronometers and watches of various designs and for various purposes. And in his collection was a watch with a contrivance for winding up and setting the hands without a key, by turning a knob in the ring or pendant by which it was attached to the chain or guard. The merit of this invention is said to be due to Mr. Viner, whose first construction was a jointed lever passing through the pendant, and acting

directly upon the main-spring, and furnished with a ratchet to prevent the recoil of the spring. More recently the spring has been wound up by means of a revolving cylinder; and this method has the advantage of giving power to set the hands also when required without a key. There are watches which wind themselves up, that is, are provided with a mechanism in which the bodily exercise of the wearer sets in motion a shifting weight, which, as the train runs down, again restores the force of the spring.

M. Ricusec, a watchmaker of Paris, obtained a prize-medal for his astronomical marking-watches, which had a second-hand, that, on a pin being touched at the time of observation, made a black spot on the dial; and this process could be repeated at very close intervals, so as to record the exact moments of a number of observed phenomena following each other very rapidly, without the necessity of taking the eye off the object watched for, in order to look at the dial.

A silver watch, which performed while suspended in a glass globe filled with water containing goldfish, was exhibited by Messrs. Pettit. The object of this invention being to secure the protection of timekeeping and other instruments from water and sea-damp.

In the Swiss collections from Geneva was a miniature watch, three-sixteenths of an inch in diameter, inserted in the top of a pencil-case, and indicating on its tiny dial not only the hours, minutes, and seconds, but also the days of the month.

Mr. Funnel, of Brighton, exhibited a small lever-watch, the diameter of which was that of a threepenny-piece.

The Rose-watch was the name under which Mr. Jones, of the Strand, exhibited a beautifully-mounted watch, the decoration of which was suggestive through-

out. On one-half of the margin around the back was engraved, on blue enamel, "Man cometh forth as a flower and is cut down." On the surface of the richly-engraved gold back was a Maltese cross in white enamel, and on its four limbs were represented the four seasons of human life, in the bud, blossom, decay, and death of a rose. On the other half of the margin round the back of the watch was inscribed the corresponding text to that above quoted, "It is sown in dishonour, it is raised in glory." In the centre of the cross was a celestial crown of diamonds on a blue enamel surface, surrounded by an Olympic wreath of pearls, with glory rays in enamel radiating between the limbs of the cross. The dial represented in coloured enamels the beautiful rose-window of Westminster Abbey. On the twelve compartments indicating the hours were the names of the twelve apostles. On the bezel edge of the glass was inscribed in blue enamel, "He that taketh not his cross daily is not worthy of me."

The International Exhibition of 1862 contained, among other articles of horology, a reversible chronometer, a chronometer showing the day of the month, a reversible, and a self-winding watch.

John Bailey, or Jack Bailey, as he was commonly called, was the chief promoter of the once fashionable acquirement of driving four-in-hand. He bequeathed to Sir Henry Peyton, the second baronet, who died in 1854, his silver watch, the regulator in all his journeys between the 'George and Blue Boar' in Holborn, and the 'Angel' inn at Oxford.

Sir William Lockyer Freestun, of Belvidere, Weymouth, Dorsetshire, who died on April 16th, 1862, aged fifty-seven, bequeathed to Lord Palmerston a watch and appendages worn by the testator, and which he

requested that his lordship would do him the honour to accept.

An enamelled gold snuff-box, with a watch movement and diamond hands, was sold by auction by Messrs. Debenham and Storr on October 18th, 1865, for twenty-four guineas.

Mr. J. T. Pickburn, a gentleman who is well known among, and respected by, the people of Clerkenwell, the great watchmaking centre, drew the following simile in a speech made by him at a public dinner in 1865, at which many horologists were present:—"That excellent contrivance, called the British Constitution, is like a watch that goes upon a diamond, John Bull's pocket being the mine from whence the metallic substance is derived that forms the main-spring. The House of Commons is the regulator; the House of Lords the balance-wheel; the Ministers the wheels within wheels; and that other estate of the realm, the Press, does duty as the dial, by which we learn how the time goes. But the jewel upon which the whole fabric turns is the Sovereign."

Mr. Benson, the eminent clock and watch maker of London, has within the last few years invented an instrument called a Chronograph, which is chiefly used for timing the duration of horse-races. It consists of an ordinary quick train lever movement, on a scale sufficiently large to carry the hands for an eight-inch dial, and with the addition of a long seconds-hand, which traverses the dial, instead of being, as usual, just above the figure VI. The peculiarity of the Chronograph consists in this seconds-hand and the mechanism connected with it. The hand itself is double, or formed of two distinct hands, one lying over the other. The lower one, at its extreme end, is furnished with a small

cup or reservoir, with a minute orifice at the bottom. The corresponding extremity of the upper hand is bent over so as to rest exactly over this puncture, and the reservoir having been filled with ink of a thickness between ordinary writing fluid and printer's ink, the Chronograph is ready for action. The operator, who holds tightly grasped in his hand a stout string connected with the mechanism peculiar to this instrument, keeps a steady look-out for the fall of the starter's flag. Simultaneously, therefore, with the start of the race, the string he holds is pulled by him, and at the same moment the upper hand dips down through the reservoir in the lower, and leaves a little dot or speck of ink upon the dial. This is repeated as the horses pass the winning-post, so that a lasting and indisputable record is afforded by the dots on the dial of the time—exact to the tenth of a second—which is occupied in running the race. As an example of the results of this instrument's operations, we may add that it timed the start and arrival of the Derby race in 1866 as follows:—Start, 3 hours 34 min. 0 sec.; arrival, 3 hours 36 min. 49 sec.; duration of race, 2 min. 49 sec.

Charlotte Florentia, Duchess Dowager of Northumberland, by her will, proved on September 28th, 1866, bequeathed to Lady Williams her diamond watch, the chain of diamonds and pearls belonging to it, and the seals.

CHAPTER XI.

Mechanical Details of Watches — Divisions in the Watchmaking Trade — Watch Chain — Hair Spring — Ticks of a Watch — Watch Glasses — A Good Watchmaker — Swiss Watches — Watches Imported into England — Duties on Watches — Depression of Watch Trade — Frauds in Watches — Epitaphs on Watchmakers — Moore's Lines with a Watch — Proverbs on Watches — Sheridan's Stratagem to get a Watch — Washington's Secretary's Watch — Anecdote of a Lord Mayor of London — Un Poisson d'Avril — How a Clergyman got a Watch from a Thief — Watch with Lettered Dial — How a Watchmaker got Trade — Watch Papers — Poetry of — Watch Stands.

We here propose to give a short account of some of the curiosities of the mechanical details of watches. A good three-quarter plate watch as usually made requires no fewer than one hundred and thirty-eight distinct pieces in its frame, train, escapement, potence, fusees, arbors, clicks, ratchets, and other nicely-contrived and adjusted constituents. To these appliances must be added the chain, which contains sixty-three links and forty-two rivets to every inch, and being generally six inches in length comprises six hundred and thirty pieces; thus swelling the contents of a common detached lever-watch to seven hundred and sixty-eight separate pieces, to construct which gives occupation to no less than thirty-eight or forty different kinds of artificers. Babbage, in his 'Economy of Manufactures,' tells us that the division of labour cannot be successfully practised unless there exist a great demand for its produce; and it requires a large capital to be employed in those arts in which it is used. In watchmaking it

has been carried, perhaps, to the greatest extent. It was stated in evidence before a Committee of the House of Commons, that there are a hundred and two distinct branches of this art, to each of which a boy may be put apprentice; and that he learns only his master's department, and is unable after his apprenticeship has expired, without subsequent instruction, to work at any other branch. The watch-finisher, whose business is to put together the scattered parts, is the only one out of the hundred and two persons who can work in any other department than his own.

The chain used in connecting the main spring and fusee in watches and clocks is composed of small pieces of sheet-steel, and it is of great importance that each of these pieces should be of exactly the same size. The links are of two sorts; one of them consisting of a single oblong piece of steel with two holes in it, and the other formed by connecting two of the same pieces of steel, placed parallel to each other, and at a small distance apart, by two rivets. The two kinds of links occur alternately in the chain; each end of the single pieces being placed between the ends of two others, and connected with them by a rivet passing through all three. If the rivet-holes in the pieces for the double links are not precisely at equal distances, the chain will not be straight, and will consequently be unfit for its purpose.

The hair-spring of a watch is no less remarkable for the extreme delicacy of its construction than for the proof which it gives of the great value that can be given to a small piece of steel by manual labour. Four thousand hair-springs scarcely weigh more than a single ounce, but cost often more than 1,000*l*. "The chisel of the sculptor," says Mr. Thompson, "may add immense value to a block of marble, and the cameo may

become of great price for the labour bestowed; but art offers no example wherein the cost of the material is so enhanced by human skill as in the balance-spring." The pendulum-spring of a watch, which governs the vibrations of the balance, costs at the retail price twopence, and weighs fifteen one-hundredths of a grain, while the retail price of a pound of the best iron, the raw material out of which fifty thousand such springs are made, is the same sum of twopence.

A watch it is said ticks seventeen thousand one hundred and sixty times in an hour, that is four hundred and eleven thousand eight hundred and forty times in a day, and one hundred and fifty millions four hundred and twenty-four thousand five hundred and ten times in a year, allowing the year to be three hundred and sixty-five days and six hours long. If a watch went, as some will, for one hundred years, it would beat fifteen thousand and forty-two millions four hundred and fifty-six thousand times.

Watch glasses were formerly made in England by workmen who purchased from the glass-house globes of five or six inches in diameter, out of which by means of a piece of red hot tobacco pipe, guided round a pattern watch-glass placed on the globe, they cracked five others; these were afterwards ground and smoothed on the edges. In the Tyrol the rough watch-glasses are supplied at once from the glass-house; the workman applying a thick ring of cold glass to each globe as soon as it is blown causes a piece of the size of a watch-glass to be cracked out. The remaining portion of the globe is immediately broken and returned to the melting pot. Formerly this process could not be adopted in England with the same economy, because the whole of the glass taken out of the pot was subject to excise duty. In

England at the present time, the crown glass, used for enclosing the dials of clocks and watches, before being moulded or bent into the required form, is first cut into circular shape by means of a circle-cutter, which consists of a circular board, covered with wash-leather, which is made to revolve on a pivot by one hand of the operator, while with the other hand he presses down a diamond on to the glass; the diamond is fixed at the end of an adjustable arm, which traverses a slot, the exact diameter of the circular plate to be cut being regulated by an index fixed at the side of the slot. The circular flat plates, which are removed to moulds turned out of solid firestone, the sinking of the moulds being of flat elliptical section, are put into one or other of the furnaces, according to the size of the glass to be bent; while in the furnace, the mould is kept in continual circular motion by the long iron rod of the operator, until the glass sinks into the required form. The grinding and polishing the edge of the glass is the next operation. By a simple and ingenious contrivance the edges of clock and watch glasses are ground. The operator stands in front of the work, with his right hand turning round a handle, placed vertically above the bench, and with his left hand holding a sort of hood, or cup, supplied with emery powder, by which the grinding is partially effected; the glass to be ground is temporarily fixed on a boxwood mallet, by means of cement, at the top of a spindle, which passes through the bench, and to which rapid motion is communicated by a round band from a horizontal wheel below the bench, turned by the right hand of the operator. After the grinding is completed, the edge of the glass is smoothed with pumice-stone, and finally polished with oxide of tin, usually called putty-powder.

"To become a good watchmaker," says Berthoud, "it is necessary to be an arithmetician in order to find accurately the revolutions of each wheel; a geometrician, to determine correctly the curve of the teeth; a mechanician, to find precisely the forces that must be applied; and an artist, to be able to put into perfect execution the principles and rules which these sciences prescribe. He must know how fluids resist bodies in motion, and be well acquainted with the effects of heat and cold in different metals; in addition to these acquirements he must be endowed by nature with a happy genius to be able to apply them all in the construction of an accurate measurer of time."

As to Swiss watches. It has been stated that the beginning of the Geneva watch-trade was owing to the bloody persecution of the Protestants in France towards the close of the sixteenth century, which caused some French watchmakers to take refuge in Switzerland. In 1587 Charles Cusin, of Autun, in Burgundy, settled in Geneva as a manufacturer of watches, which were then sold for their weight in gold. He had many scholars, and his success naturally drew labour from less profitable employment, and spread the watchmaking trade very rapidly. But the substantial introduction of watch manufacture into Switzerland, which, by the extensive employment of female labour, competes successfully with England, occurred in this manner:—In 1679 a native of Switzerland, after a visit to this country, took home with him from London a watch, which was a novelty in his mountain land, and greatly excited the curiosity and interest of all who saw it there. On its getting out of order the owner of the watch trusted it for repair to a mechanic, named Daniel John Richard, of La Sange, who, after attentively examining the me-

chanism of it, determined to construct a watch after its model. He according spent a year in making the requisite tools, and in six months afterwards completed a watch. He next set up in the trade of a watchmaker, and supplied his neighbourhood with watches. He died in 1741, leaving five sons, who pursued their father's profitable business. The trade has been largely developed during the present century, and Swiss watches are in universal demand on account of their cheapness. Mr. J. Bennett, whose advocacy of female labour in the watchmaking art has rendered him very obnoxious to some persons, calculated a few years ago that no less than two hundred thousand Swiss watches were annually imported or smuggled into England, while the whole produce of the English watchmakers did not exceed one hundred and eighty-six thousand. In the valleys and on the slopes of the Jura mountains, during a winter which lasts six or seven months, the inhabitants, who are kept indoors by the inclemency of the weather, vigorously pursue some one or other of the several departments of the watch-trade. Mr. Bennett states that on a visit paid by him to Neufchâtel, where the largest number of the Swiss watches are made, he found no less than twenty thousand women employed in making the more delicate parts of the watch movement, and earning upon an average fifteen shillings per week each. They produced annually about one million five hundred thousand watches, besides movements, for the American markets.

An old astronomical watch of Swiss manufacture was exhibited by Mr. Morgan to the Society of Antiquaries in 1850. It was made at Geneva by Jean Baptist Duboule, and bore a striking contrast to the Geneva watches now in use. It was of large dimensions, being three inches and a half in diameter and two inches

thick, and was in fact a clock-watch; it had an alarum, and showed on the different circles of its face the hours and the period of the day, whether morning, noon, evening, or night, by certain allegorical figures engraved on a revolving disc, which changed suddenly, and presented themselves at proper times. The days of the week were also represented by revolving figures, the days of the month, the name of the month, and the number of days it contained, together with the sign of the zodiac in which the sun was, the age of the moon and its phases, and the four seasons of the year, "as they in their circle run" by allegorical figures engraved on a revolving disc in the same manner as the four periods of the day. This complicated and beautiful piece of mechanism was not quite in its original state; some former possessor about a century and a half ago caused a new balance-wheel with pendulum-spring to be added, to make it perform more regularly. It was enclosed in a travelling-case of black leather, ornamented with silver studs.

The importation of cheap foreign watches in great numbers into England obviously must have a depressing influence upon the English trade, by lessening the demand, as numbers of unwary persons who study a false economy, purchase those of Swiss make, on account of their tempting cheapness. The number of watches imported from Switzerland into this country in 1858 was three hundred and forty-six thousand eight hundred and ninety-four. The returns of Goldsmiths' Hall afford the following statistics of English manufacture in the number of watch-cases hall-marked, in 1858:— London, eighty-three thousand six hundred and fourteen silver, and twenty-six thousand eight hundred and seventy gold; in Coventry, sixty thousand silver. By

our transatlantic cousins British watches were preferred; thus, in 1857 we exported to America fourteen thousand one hundred and forty-one watches of home manufacture, and four hundred of foreign make. On the contrary, Australia showed a preference for foreign watches, by taking six thousand seven hundred and twenty-two of them, and only three thousand and eighty-two of British manufacture. During the year 1860 one hundred thousand foreign watches passed through the custom-house for home use. The number of foreign watches imported into England free of duty during the first seven months of the year 1865 was eighty-six thousand one hundred and fourteen, and during the first eight months ninety-six thousand four hundred and one as against eighty-seven thousand two hundred and eighty-two in 1864, and one hundred thousand nine hundred and thirty-eight in 1863, periods corresponding with the latter months.

The parliamentary inquiries which have been instituted from time to time into various matters connected with the clock and watch trade have served to enlighten us as to its extent, and the regulations by which it was controlled. All the clockmakers and other persons using their trade within London and ten miles therefrom were incorporated into one body, with powers to make by-laws for the government of those persons who used the trade throughout England, and to control the importation of foreign clocks and watches into this country, and to mark such as were imported. By the custom of marking foreign watches with the stamp of the Clockmakers' Company, of marking each English watch with the maker's name, and of the stamping of the cases at Goldsmiths' Hall, the number of watches produced in England became tolerably well ascertained.

In a report from a committee of the House of Commons in 1818 it is stated that the number of gold and silver watch-cases marked at Goldsmiths' Hall in the year 1796 amounted to one hundred and ninety-one thousand six hundred and seventy-eight; and in the year 1798, when duties were imposed on clocks and watches, and a licence to deal therein was made necessary, the number of watch-cases hall-marked was reduced to one hundred and twenty-eight thousand seven hundred and ninety-eight, showing a decrease of sixty-two thousand eight hundred and eighty. Although these duties were repealed, the manufacture never recovered itself. In 1808 the number of watch-cases marked was most approximate, it being one hundred and eighty thousand three hundred and eighty-nine. From this year the number diminished, so that in 1815 only one hundred and thirty-four thousand two hundred and sixty-nine watches were hall-marked; and in 1816 only one hundred and two thousand one hundred and twelve, rather more than one-half of the number marked in 1796. Babbage, in his 'Economy of Manufactures,' says that the number of watches manufactured for home consumption was in 1798 about fifty-thousand. If this supply was for Great Britain only, it was consumed by about ten and a half millions of persons.

Two causes are clearly assignable for the signal declension in the manufacture of watches, as mentioned above, namely, the imposition of a duty on clocks and watches in 1797, and the illicit importation of foreign watches. During the Pitt administration, an act was passed levying certain duties upon clocks and watches, to be paid by the possessors of them. It was ordered by this act that, after July 5th, 1797, an annual duty of five shillings should be charged on every clock or time-

keeper; for every gold watch kept, worn, or used, ten shillings; and for every silver or metal watch, two shillings and sixpence per annum. From this pernicious tax the Royal Family were exempt, as were also hospitals and churches, farm-servants, soldiers, and sailors; nor did it extend to the stock of pawnbrokers and clock and watch makers; but it required them to take out annually, at a cost of two shillings and sixpence, a licence to sell those goods. The duty in a single year amounted to 48,820*l.* But the act was repealed in 1798, owing, it is said, to the representations of a committee of watchmakers convened in Clerkenwell, who proved to Mr. Pitt that a piece of work valued at 500*l.* had been manufactured out of materials which did not in their rough original state cost so much as sixpence. Dr. Rees says, "This representation, we are credibly informed, induced the great statesman to abandon his plan of taxing an article, the value of which depended so much upon the ingenuity and labour by which thousands were entirely supported; nay, further, on learning that the French and Swiss could afford to sell three gold watches for the price of one English one, the same minister took off the duty of 16*s.* per ounce from watch-cases of that metal, and substituted 1*s.*, the price of marking at Goldsmiths' Hall." In the years 1797 and 1798, the Clockmakers' Company appealed to Parliament respecting the severity of the act. The petition was presented to the House on February 23rd, in the latter year, by Alderman Lushington, M.P., and after being read was referred to a Committee, with other petitions on the same subject. On the 27th the bill for repealing the duty on gold and silver watch-cases was read a third time, and passed up to the House of Lords. On March 14th, the Chancellor of the

Exchequer stated in the House of Commons that the repeal of the watch act would cause a deficiency of 200,000*l.*, and as this tax was proved by experience to press heavily upon a very industrious and useful part of the community, he would, in order to meet the rules of the House, simply propose to repeal the tax on clocks, watches, and time-keepers; and on a future day bring forward another measure to meet such deficiency. His motion formally was, "that the tax on clocks, watches, and timekeepers made last session should cease and determine," which was agreed to. On the following day Mr. Hobart brought up a report of this resolution of the Committee of the whole House, which was read and assented to. The act imposing the duty had occasioned great distress among the watchmakers of Clerkenwell.

On June 6th, 1814, Sir William Curtis presented a petition to Parliament from the clock and watch makers, stating that they exported goods to the value of 500,000*l.* annually; and that their trade was in danger of being ruined by the importation of foreign clocks and watches to which the names of English workmen were affixed. In the years 1816 and 1817, great distress prevailed among the watchmakers of Clerkenwell, many of whom were reduced to the extremity of want. At no period since 1797 had there been such a lack of employment; the earnings of such as obtained work in the last three months of 1816 averaged seven shillings and sixpence per week. A philanthropic society was formed, and upwards of three thousand indigent workmen were relieved from its funds. Two pawnbrokers in Clerkenwell alone had watchmakers' tools in pledge to the amount of 190*l.*, a sum not exceeding one-third of their real value. This depression

in the clock and watch trade was attributed to the extensive illicit importation of such articles from Geneva and other parts of Switzerland, the movements being brought over into this country, put into English cases, and then sold as English watches; while others were made up complete so as to resemble those of British manufacture. Babbage, writing in 1835, says that in the watch trade the practice of deceit, in forging the marks and names of respectable makers, had been carried to a great extent both by foreigners and natives; and the effect upon our export trade had been most injurious, as the following extract from the evidence before a Committee of the House of Commons proved:—

Question. How long have you been in the trade?

Answer. Nearly thirty years.

Q. The trade is at present much distressed?

A. Yes, sadly.

Q. What is your opinion of the cause of that distress?

A. I think it is owing to a number of watches that have been made so exceedingly bad that they will hardly look at them in the foreign markets; all with a handsome outside show, and the works hardly fit for anything.

Q. Do you mean to say, that all the watches made in this country are of that description?

A. No; only a number which are made up by some of the Jews, and other low manufacturers. I recollect something of the sort years ago, of a fall off of the East India work, owing to there being a number of handsome-looking watches sent out, for instance, with hands on and figures, as if they showed seconds, and had not any work regular to show the seconds: the hand went round, but it was not regular.

Q. They had no perfect movements?

A. No, they had not; that was a long time since, and we had not any East India work for a long time afterwards.

In the home market inferior but showy watches were made at a cheap rate, which were not warranted by the maker to go above half-an-hour; about the time occupied by the Jew pedlar in deluding his country customer.

According to the census of 1861 there were eight hundred and seventy-seven watch and clock makers in Clerkenwell.

At Lydford, in Devonshire, is the following epitaph on a watchmaker:—

"Here lies in a *horizontal* position,
the outside *case* of
George Routleigh, watchmaker,
whose abilities in that line were an honour to his profession.
Integrity was the *mainspring*, and prudence the *regulator*
of all the *actions* of his life;
Humane, generous, and liberal, his *hand* never *stopped*
till he had relieved distress:
So nicely *regulated* was his *movements*,
that he never *went wrong*,
except when *set a-going*
by people who did not know his *key*:
Even then he was easily *set right* again.
He had the art of disposing of his *time*
so well,
That his *hours* glided away in one
continual *round* of pleasure and delight,
Till an unlucky *moment* put a *period* to his existence.
He departed this life November 14, 1802,
Aged 57, *wound up*,
in hopes of being taken in *hand* by his *Maker*:
And of being thoroughly *cleaned*, *repaired*, and *set a-going*
for the world to come."

In Uttoxeter churchyard is the following epitaph,

which was written on himself by a watchmaker, who was fond of good ale:—

"Here lies one who strove to equal time!
A task too hard, each power too sublime.
Time stopt his motion, o'erthrew his balance-wheel;
Wore off his pivots, though made of harden'd steel;
Broke all his springs, the verge of life decay'd,
And now he is as though he'd ne'er been made.
Not for the want of oiling—that he tried,
If that had done—why then he ne'er had died."

At Shrewsbury is the following epitaph on a watchmaker:—

"Thy movements, Isaac, kept in play,
Thy wheels of life felt no decay
For fifty years at least;
Till by some sudden secret stroke,
The balance or the mainspring broke,
And all the movements ceas'd."

Moore sent the following lines, "To a Boy with a Watch:"—

"Is it not sweet, beloved youth!
To rove through Erudition's bowers,
And cull the golden fruits of Truth,
And gather Fancy's golden flowers?

"And is it not more sweet than this,
To feel thy parents' hearts approving,
And pay them back in sums of bliss,
The dear, the endless debt of loving?

"It must be so to thee, my youth;
With this idea toil is lighter;
This sweetens all the fruits of Truth,
And makes the flowers of Fancy brighter.

"The little gift we send thee, boy,
May sometimes teach thy soul to ponder,
If indolence or syren joy
Should ever tempt thy soul to wander.

"'Twill tell thee that the wingèd day
Can ne'er be chain'd by man's endeavour;
That life and time shall fade away,
While heaven and virtue bloom for ever."

The following two old proverbs relate to watches:—"You may be a wise man though you cannot make a watch;" "A man, like a watch, is to be valued for his goings."

This story is told of Sheridan's stratagem to get a watch:—Harris, the proprietor of Covent Garden Theatre, who had a great regard for Sheridan, had at different times frequent occasion to meet him on business, and made appointment after appointment with him, not one of which was ever kept by Sheridan, who during his life wasted much of old Time's sand. At length Harris, wearied out, begged his friend Palmer, of Bath, to see Sheridan, and tell him that unless he kept the next appointment made for their meeting, all acquaintance between them must end for ever. Sheridan expressed great sorrow for what in fact had been inevitable, and positively fixed one o'clock the next day to call upon Harris at the theatre. At about three o'clock he made his appearance in Hart Street, where he met Tregent, the celebrated French watchmaker, who was extremely theatrical, and had been the intimate friend of Garrick. Sheridan told him that he was on his way to call upon Harris. "I have just left him," said Tregent, "in a violent passion, having waited for you ever since one o'clock." "What have you been doing at the theatre?" said Sheridan. "Why," replied Tregent, "Harris is going to make Bate Dudley a present of a gold watch, and I have taken him half-a-dozen that he may choose one for that purpose." "Indeed," said Sheridan. They wished each

other good day and parted. Sheridan proceeded to Harris's room, and when he addressed him it was evident that his want of punctuality had produced the effect which Tregent had described. "Well, sir," said Harris, "I have waited at least two hours for you again; I had almost given you up, and if—" "Stop, my dear Harris," said Sheridan, interrupting him, "I assure you these things occur more from my misfortunes than my fault; I declare I thought it was but one o'clock, for it so happens that I have no watch, and to tell you the truth, am too poor to buy one; but when the day comes that I can, you will see I shall be as punctual as any other man." "Well, then," said the unsuspecting Harris, "if that be all, you shall not long want a watch, for here" (opening his drawer) "are half-a-dozen of Tregent's best; choose any one you like, and do me the favour of accepting it." Sheridan affected the greatest surprise at the appearance of the watches; but did as he was bid, and selected certainly not the worst for his present.

When Washington's secretary excused himself for the lateness of his attendance, and laid the blame upon his watch, his master quietly said, "Then you must get another watch, or I another secretary."

The following original anecdote has been communicated to the author by Mr. John Bullock, of Sevenoaks:—A gentleman, who now fills a responsible situation in one of the national exhibitions, some years since became bail for a friend; and went before the then Lord Mayor of London to justify, when this conversation took place:—

Lord Mayor. What is your name?

Bail. W—— F——.

Lord Mayor. Well, Mr. F——, you have come here to be bail for your friend; what are you?

Bail. An articulator, my lord. (An articulator is one who puts in correct order the bones or skeletons of animals.)

Lord Mayor's Clerk. What is that?

Lord Mayor. Oh! I know, you have to do with clocks and watches.

The Bail, being unwilling to expose my Lord, bowed assent; and so the chief magistrate of the City passed for wise, and matters went off satisfactorily.

It is related that a French lady having stolen a watch from a friend's house on the first of April, endeavoured after detection to pass off the affair as *un poisson d'Avril*, an April joke. On denying that the watch was in her possession, a messenger was sent to her apartments, where it was found upon a chimney-piece. "Yes," said the thief, "I think I have made the messenger a fine *poisson d'Avril.*" But the magistrate before whom she was taken said she must be imprisoned until the first of April in the ensuing year, *comme un poisson d'Avril.*

Dr. Bigsby tells the author that an old friend of his, a Nottinghamshire clergyman, being in London, went one evening to the pit of Drury Lane Theatre to see some famous actor of the day—Kemble or Kean. There was a great rush for admission at the entrance, and, while sorely pressed by the crowd, he felt somebody's hand busy with his watch-pocket. Searching to see if his watch was safe, he found that his fob was empty; whereupon, remarking a suspicious-looking fellow immediately in advance of him, he promptly charged him, but in a whisper only, with the robbery. "You've got my watch," said he. At the next moment a watch was

slipped into his hand by the party addressed, with the words, "Say nothing about it; here it is." The clergyman conveyed the article to a more secure place of deposit, and thought little more of the matter until his arrival at his inn, after the close of the performance. On going up to his bedroom at the 'Bull and Mouth,' the first object he saw was the black ribbon, with the seals appendant, of his own watch, hanging at the bed's head; and on examining his coat-pocket, he found a most magnificent watch, of the value of some forty or fifty pounds, that had doubtless been stolen a short time before it had been handed to himself by the thief in question. He repeatedly advertised the watch in the newspapers, but it was never claimed; and he used afterwards to exhibit it to his friends, and tell its story to them, with a comic expression of satisfaction at the idea of having fleeced an Arab of his spoil in so unconscious a manner.

Apropos of watch stealing, we are reminded of a silver hunting-watch that belonged to one of the whippers-in of Lord Middleton's fox-hounds in Nottinghamshire. It had the words "Jack Stevens" on its face instead of the usual figures, the letters representing eleven figures, and in lieu of the twelfth figure was a fox's head. Such an arrangement might, in many instances, save a watch from being stolen.

The following story is told of a poor watchmaker's trick to obtain employment:—He settled at a populous country town, where he was unknown, and had no trade. He contrived when the church door was opened daily, to send up his son to the church-tower unseen, to alter the clock. This the lad was enabled to do; and as every one swore by the church-clock, all the watches in the neighbourhood were repeatedly found to be wrong.

Consequently the owners of them sent them to the newcomer to be repaired and set right.

By the way we may add a few particulars relating to watch-papers as they were called, but which were as often of silk, velvet, and muslin, printed or worked with the needle, as of the material whence they derive their name. These papers were used in the outer cases of the large old-fashioned watches, before the introduction of the present compact form of such instruments; and were decorated with verses or devices, as tokens of love or friendship. The papers were frequently very neatly cut with elaborate designs, sometimes spreading over the whole field, while at others a circle or oval was left in the centre, on which was painted a miniature. One old paper had these lines engraved upon it:—

"Content thy selfe withe thyne estat,
And sende no poore wight from thy gate;
For why, this councell I thee give,
To learne to dye, and dye to lyve."

In another, the following lines were so regulated as to be printed in a circle without a break:—

"Onward—
Perpetually moving—
These faithful hands are proving
How soft the hours steal by:
This monitory pulse-like beating,
Is often times methinks repeating,
'Swift, swift, the hours do fly!'
Ready, be ready! perhaps before
These hands have made
One revolution more,
Life's spring is snapt,—
You die!"

Another version of these lines was set to music early in the present century:—

"Onward perpetually moving,
These faithful hands are ever proving
How quick the hours fly by;
This monitory pulse-like beating
Is often times methinks repeating,
'Swift! swift! the moments fly.
Reader, be ready, for perhaps before
These hands have made one revolution more,
Life's spring is snapt—you die!"

In an old silver-watch were these printed lines:—

"Time is—the present moment well employ;
Time was—is past—thou canst not it enjoy;
Time future—is not, and may never be;
Time present—is the only time for thee."

We find the following "Lines on a Watch-paper" in the 'Gentleman's Magazine' for May, 1797, with the initials M. E. L.:—

"Life's morning hours unthought-of fly,
Without watch;
Life's noontide hours neglected die
By deaf watch;
Life's eve's repentance makes us cry,
For stop watch;
Life's midnight hour then beats by sigh,
A death watch."

A watchmaker named Adams, who practised his craft early in this century at Church Street, Hackney, was fond of putting scraps of poetry in the outer cases of watches sent to him for repair. One of his effusions was as follows:—

"To-morrow! yes, to-morrow! you'll repent
A train of years in vice and folly spent.
To-morrow comes—no penitential sorrow
Appears therein, for still it is to-morrow.
At length to-morrow such a habit gains,
That you'll forget the time that Heaven ordains,
And you'll believe that day too soon will be
When more to-morrows you're denied to see."

Two watch-papers, executed at the commencement

of the reign of George III., the one of white cambric wrought in gold thread with the letters G. M. C. within a double circle of loop-chain work; and the other of white muslin, with the initials S. G. in brown hair, are still preserved. Printed watch-papers with the head of William, Duke of Cumberland, were published in 1746, and some of white and pink satin with the portrait of Queen Caroline were common about the year 1821. Perhaps the most famous watch-papers were those printed on the ice during the frost fair of 1814.

It seems that watchstands came into use about the middle of the seventeenth century, but their history is very uncertain. One of that date is still preserved; it is of carved oak, eight inches high, and in design much resembles some of the mural monuments of the period. Two scrolls form a sort of pediment above, with an escalop-shell in front. It has side columns with four large flowers surrounding the circular opening for the face of the watch, and the lower part is pointed. At the back is a curved channel to contain the chain, which when placed in the stand together with the watch was shut in with a sliding backboard. Immediately behind the shell is a round hole to admit a hook or nail, by which the stand was suspended against a wall. There is also extant another watchstand of carved wood, nine inches and three-quarters high, of German workmanship, of the time of Francis I., 1741–1765. It represents the two-headed eagle, the imperial crown being placed between the necks; a branch of laurel proceeds from the crown and falls on each side of the circular opening in the breast of the bird. The sockets of the wings are still visible, but the wings themselves are gone. The bird stands upon a base of three stages, and the whole is painted in various colours.

Some of the old watchstands represented Time, from whose finger the watch depended; others were in the shape of horses, camels, and elephants, with panniers, vases, and temples on their backs; and others of a more common description were in the shape of churches and castles, with the watch-face appearing in the turret and over the gateway.

During the last century ladies exercised their ingenuity in making watchstands of rockwork formed of bits of spa, galena, and coloured glass, garnished with green moss; or of shells and seaweeds; or of cardboard besprinkled with glittering frostings, and decorated with cut, folded, and twisted paper, and gold and silver foil and spangles.

CHAPTER XII.

The Chronometer — Philip III. offers a Reward for — Dr. Hooke's Suggestions — Lord Kingkardine's Project — Major Holmes's Experiment — Reward offered by the English Government for Discovery of Longitude — John Harrison's Invention — Graham's Advice — Harrison's Voyages with his Chronometers — Obtains the Reward — Publications relating to his Chronometer and Voyages — His Tomb — Berthoud — Thomas Mudge — John Arnold — Thomas Earnshaw — Application of the Chronometer — Instances of the Advantages of the Chronometer — Captain Cook's Chronometer — Prizes for good Chronometers — The Chronometer Room at Greenwich Observatory — Dent's Chronometers — Chronometer Repeater — Chronometer a relic of the Franklin Expedition.

THE history of that important and valuable instrument, the chronometer, we think, will be most interesting. To find the longitude at sea, that is, the distance of any place eastward or westward from the first fixed meridian of a country was for ages a desideratum. The attention of navigators and mathematicians was in early times especially directed to it in consequence of its extreme importance. Philip III. of Spain, as early as the year 1598, offered a reward of one hundred thousand crowns to any person who should discover the means of finding the longitude of a ship at sea; and not long afterwards the States General of Holland, to which as a maritime nation it was most important, offered ten thousand florins to anyone who should solve the problem, which was then considered to be so difficult, that Morin, speaking to Cardinal Richelieu on the difficulty of constructing an instrument that should keep time with the accuracy required for such a

purpose, said, "I know not what such an undertaking would be to the devil himself, but to man it would undoubtedly be the height of folly."

In the year 1662, Dr. Hooke, who disputed more than one of Newton's discoveries, tells us in a paper read before the Royal Society, "The Lord Kingkardine did resolve to make some trial what might be done by carrying a pendulum-clock to sea, for which end he contrived to make the watch part to be moved by a spring instead of a weight, and then making the case of the clock very heavy with lead, he suspended it underneath the deck of the ship by a ball and socket of brass, making the pendulum but short, namely, to vibrate half-seconds; and that he might be the better enabled to judge of the effect of it, he caused two of the same kind of pendulum-clocks to be made, and suspended them both pretty near the middle of the vessel, underneath the deck. Thus done, having first adjusted them to go equal to one another, and pretty near to the true time, he caused them first to move parallel to one another, that is, in the plane of the length of the ship; and afterwards he turned one to move in a plane at right angles with the former; and in both these cases it was found by trials made at sea (at which I was present) that they would vary from one another, though not very much." The philosopher concludes by saying that "they might be of very good use at sea if some farther contrivances about them were thought upon and put into practice."

Another experiment was made by Major Holmes, in a voyage from the coast of Guinea in 1665, which led the celebrated mathematician, Huygens, who was born in 1629, and died in 1695, and who had paid great attention to watches, and written a treatise on their use in finding the longitude at sea, to determine if pos-

sible to improve a watch for that purpose; but he found himself baffled by the irregularities of action caused by the alternations of heat and cold. In the 'Philosophical Transactions' appears 'A Narrative concerning the success of Pendulum Watches at Sea, for the Longitude,' 1665, by Major Holmes. In the same work we find 'Instructions concerning the Use of Pendulum Watches for finding the Longitude at Sea,' 1675, by Christian Huygens.

In the year 1714, the British Government exceeded in liberality any premiums before offered for the desired and much-delayed discovery of the manner of finding the longitude at sea. A Board of Longitude was formed, and an Act of Parliament was passed in the twelfth year of the reign of Queen Anne for a sum not exceeding 20,000*l.* for defraying the cost of the necessary experiments for ascertaining the longitude, and for granting a proportionate reward to any person whose inventions or improvements should be an advancement of the great object in view. The limits were within sixty, forty, or thirty miles.

Previous to the offer of the liberal reward by the British Government strenuous efforts were made, and experiments tried by various individuals; but it was reserved for John Harrison, a native of Yorkshire, who was born in 1693, and was the son of a carpenter, to make the grand discovery which would be of everlasting benefit to mankind. He was a thoughtful, ingenious, and accurate mechanic. In the year 1728 he came to London, bringing with him diagrams of a machine for determining the longitude, in expectation of being engaged to make one for the Board of Longitude. His invention was examined by the celebrated George Graham. Stukely, in his manuscript journal

says, "I saw his famous clock last winter at Mr. George Graham's. The sweetness of the motion, the contrivances to take off friction, to defeat the lengthening and shortening of the pendulum through heat and cold, cannot be sufficiently admired." Graham advised the ingenious young artist to return home, and construct from the drawings which he had submitted to him his longitude machine. He did so, and seven years after he again came to London, bringing with him the first chronometer, which was a large watch, by which the longitude at sea might be correctly determined; for its variations had not been a second in a month, in this respect far surpassing for accuracy any of the time-measurers then in use. Having obtained certificates of its excellence from Halley, Graham, and others, he was allowed, in 1736, to proceed with his chronometer to Lisbon on board one of the Government ships, and was enabled to correct an error in the ship's reckoning of one degree and a half. Upon this the Board of Longitude awarded him 5,000*l.* to proceed with his improvements. He had at least one rival in his work, for we find that on November 28th, 1749, a foreigner, who came to make some discoveries in relation to the longitude, was by order of council examined by several eminent mathematicians and astronomers; but what he had done having been before demonstrated by others, he was dismissed with an order for a small sum to defray his expenses home. On November 30th, in the same year, the Royal Society gave their annual prize-medal of gold to Harrison "on account of his very curious clock for discovery of the longitude."

By the year 1761 he had completed three chronometers, the last made being the most accurate. With this one he was so satisfied that he applied to the com-

missioners for leave to make an experiment with it in a voyage to the West Indies. Permission was granted, but, in consideration of Harrison's advanced age, his son was allowed to proceed to Jamaica instead of himself. After eighteen days' sailing on the voyage which was to test Harrison's chronometer, the vessel was supposed by the captain to be thirteen degrees fifty minutes west of Plymouth; but the chronometer gave fifteen degrees nineteen minutes, or about a degree and a half more. This variation destroyed for a time all confidence in the instrument. But Harrison's son surmised that the actual error might be in the chart, and so firmly maintained that Portland Island would be seen the following day, that the captain was induced to pursue the same course; and the island was actually discovered the next day. When the vessel arrived at Port Royal, in Jamaica, after a voyage of eighty-one days, the chronometer was found to be about two seconds too slow. On the return to Portsmouth, after a voyage of five months, the variation had amounted to nearly one minute and five seconds, which gave an error of sixteen miles of longitude. A further test was allowed the chronometer, and the younger Harrison undertook a voyage to Barbadoes, carrying it with him. Its performance was excellent; and all the requirements of the Act of Parliament being fully satisfied, John Harrison, the first chronometer-maker, now an old man, received the justly-merited reward of persevering genius and unremitting toil, the 20,000*l.* offered by Government for the discovery which he had so completely made.

At a meeting of the Board of Longitude, held on February 9th, 1765, it was unanimously determined that the performance of Harrison's time-keeper had been such as to entitle him to the offered reward; but it

was resolved that until certain conditions had been complied with, only 10,000*l.* should be paid. It was part of Harrison's agreement to take to pieces and explain the principles and construction of his time-keeper. This he did on August 22nd, 1765, in the presence of the following gentlemen, who had been appointed by the Board, and of the Rev. Mr. Maskelyne, who insisted on having a right to attend, as being a commissioner:—John Mitchell, William Ludlam, John Bird, Thomas Mudge, William Mathew, and Larcum Kendal. It was not until the year 1773 that Harrison succeeded in obtaining an Act of Parliament for payment of the remaining 10,000*l.* He employed the latter days of his life in constructing a fifth chronometer, which was so far accurate, that, after ten weeks' trial in the King's private observatory at Richmond, it was found to have erred only four-and-a-half seconds. The success of Harrison's chronometer was owing to the application of a self-compensating piece of mechanism to the balance-wheel, which contrivance, according to his provincial dialect, he called a knib; but it is now more euphoniously called the compensation-curb, and is applied to watches for correcting variations in the rate of going from changes in temperature.

In 1765 was published a work, entitled 'Minutes of the Proceedings of the Commissioners concerning Mr. Harrison's Time Pieces.' Afterwards was published 'An Account of the going of Mr. Harrison's Watch at the Royal Observatory from May 6th, 1766, to March 4th, 1767.' In the latter year was published 'The Principles of Mr. Harrison's Time Keeper,' by Nevil Maskelyne, with plates and notes, issued by order of the Commissioners of Longitude. In 1775 Harrison published 'A Description concerning such Mechanism as

will afford a nice or true Mensuration of Time.' The author was a clever mechanic, but he was utterly unqualified to explain by his publications his own notions and inventions.

An engraved bust of "Longitude Harrison," as he was called, who died at his house in Red Lion Square, on March 24th, 1776, aged eighty-three, appears in the 'European Magazine' for 1788, the artist being B. Reading. His portrait also appears in Knight's 'Portrait Gallery,' from an engraving by Tassaert, published in 1768, after a painting by King. In the 'Memoirs of a Trait in the Character of George III.,' by Johan Horrins (the anagram of John Harrison), 1835, we read that "The remains of John Harrison were consigned to a vault on the south side of Hampstead church; but a difference of opinion arising between his son and daughter on the subject of a monument, the place remained unnoticed for several years. After the death of his sister, William Harrison erected a tomb from a regular design, in the prevailing style, with an inscription indicative of his respect for his father's genius, but the taste of which cannot be commended, as it may be said to smell of the oil in a sense different from that applied to the compositions of Demosthenes. The celebrity of the first man that found the longitude might have been estimated here, for, although it was many years after he had departed this sublunary scene, the news of the monument and of the epitaph soon travelled rapidly through an alphabetical nomenclature, and parties were formed in great Augusta (as the poets call London) for a walk to Hampstead, to view this sepulchre and the record of its occupant—not, indeed, so numerous as the pilgrims of Thomas à Becket, but yet sufficiently so to show the contrast between the

ignorant, or the learned inattention (which must we call it?), and this plain manifestation of the public sentiment; for the sexton told a stranger who was making inquiries, he was sure not fewer than ten thousand people had visited the place within two or three months after the masons had left it." On the south side of the same monument is an inscription to William Harrison's memory.

It seems that while the English were engaged on the subject of the longitude the French also were busy with it. Thus, in 1763 was published an 'Essai sur l'Horlogerie,' by Berthoud, who treated of this art relatively to civil use, astronomy, and navigation, upon principles confirmed by experience. Afterwards was published 'An Account of a Voyage performed in 1768 and 1769, by order of the French King, in order to prove some Time-pieces invented by Berthoud.' In 1773 this artist issued his 'Traité des Horloges Marines.'

Thomas Mudge, the celebrated watchmaker, was born at Exeter in 1715 or 1716. He was apprenticed to George Graham, whom he succeeded in busines, as appears from the following notice in the 'Daily Advertiser' of November 18th, 1751:—"Thomas Mudge, Watchmaker, Apprentice to the late Mr. Graham, Carries on the Business in the same Manner Mr. Graham did, at the sign of the Dial and one Crown, opposite the Bolt and Tun in Fleet Street." Mudge became one of the most eminent mechanists of his time. A select committee of the House of Commons, assisted by a committee of men of science, philosophical instrument makers, and watchmakers, including Atwood Ramsden, Troughton, and De Luc, declared in 1793 that it was "admitted on all hands that Mr. Mudge was one of the first watchmakers that this country has produced."

In consequence of a report made by the select committee a reward of 3,000*l.* was granted by Parliament for his improvements in the construction of chronometers. In 1765 was published 'Thoughts on the means of improving Watches, and particularly those for use at Sea,' by Thomas Mudge. In 1772 was published the mezzotinto portrait of Mudge, sitting, engraved by Townley after N. Dance. The subject of it died in 1794. A full account of his invention, and of the circumstances in the history of chronometry connected with it, will be found in a work published by his son, Thomas Mudge the younger, in 1799, entitled 'A Description, with Plates, of the Time Keeper invented by Mr. Thomas Mudge.'

En passant, we may state that Mudge appears to have been a friend of Sir Joshua Reynolds. James Northcote, the artist, whose passion for art long remained ungratified, was compelled by his father, who discouraged his yearnings, to drudge in the watch trade. His eldest brother, Samuel, was sent to London in 1766, to get instructed in the business, and Mudge gave him an introduction to Reynolds. "Do go often to Reynolds's," James wrote to him, "that when I have the pleasure of seeing you I may hear all about it. Mr. Mudge says he knows you are exceedingly welcome, as he is the most good-natured creature living."

The complex construction of Harrison's chronometers, and the high price, 400*l.*, demanded by Kendall, his assistant, to make them rendered necessary the discovery of a time-keeper that would come within the means of purchase by private individuals. In this Earnshaw first succeeded; but his improvements were pirated by John Arnold, who claimed also the invention of the detached escapement, which Earnshaw was the first to apply.

This escapement allows the vibrations of the balance to be more free and equal than in an ordinary timepiece, by completely detaching it from the train of wheels during the greater part of each vibration. Two experimental watches, now in the possession of the Royal Society, appear to contain Arnold's first attempt at the detached escapement. Another important improvement introduced by Earnshaw and adopted by Arnold, about 1776, was the cylindrical balance-spring, which is more perfect in action than the ordinary spiral balance-spring. Arnold appears to have been the first to make balance-springs of gold, to avoid corrosion; he also used silver and platinum in the formation of balances, to obviate the evils found to arise during a thunderstorm from the magnetization of the steel. He also was the first who, by systematizing the business of chronometer-making, reduced the price to such an amount as to render them generally available.

In June, 1793, a claim for a reward for improvements in chronometers having been made by Mudge, and opposed by the Board of Longitude, it was brought by petition before the House of Commons, and referred to a select committee, who called to their assistance a sub-committee, consisting of some of the most celebrated watchmakers and mathematical instrument-makers of that day. The committee reported favourably to the House on Mudge's claim, and he received 3,000*l.* reward as previously stated. Subsequently, Arnold and Earnshaw applied for the rewards offered for the discovery of the longitude. The claims of the rival candidates were very warmly supported, the first by Sir Joseph Banks, the second by Dr. Maskelyne. The whole matter was brought before the Board of Longitude, and ultimately each of the claimants received 3,000*l.* In Sir

John Soane's Museum is a chronometer. which was made by Mudge as a companion to that for which he received the parliamentary reward. An inscription round the top states that it was invented in 1793 by this mechanic. It is now in going-order, and it formerly belonged to the Duke of Marlborough.

In 1780 was published 'An Account kept during thirteen months in the Royal Society at Greenwich of the going of a Pocket Chronometer made on a new construction, having his new invented balance-spring, and a compensation for the effects of heat and cold in the balance; published by permission of the Board of Longitude,' by John Arnold. In 1781 was published a treatise 'On the Longitude; in a Letter to the Honourable Commissioners of that Board; containing Remarks on the accounts given of a Clock at Manheim, and that of a Pocket Chronometer at Greenwich, both made by Mr. John Arnold.' In 1781 also was published in London, from the German, 'A Letter from Mr. Christian Meyer, Astronomer to the Elector Palatine, to Mr. N. N., on the going of a new Pendulum Clock, made by Mr. John Arnold, and set up in the Elector's Observatory at Manheim.' In 1806 was published 'Explanations of Time Keepers, constructed by the Author and the late John Arnold,' published by order of the Commissioners of Longitude, by Thomas Earnshaw. In 1809 the same writer published 'An appeal to the public, stating the author's claims to the original improvements in his Time Keepers.' John Arnold died in 1799, aged fifty-five, and was buried in Chislehurst churchyard.

In 1772 was published 'A Voyage to Newfoundland and Sallee to make Experiments on Le Roy's Time

Keepers,' by M. De Cassini. The same work in English translated from the French appeared in 1778.

In the 'Philosophical Transactions' are papers on "Investigations, founded on the theory of motion, for determining the Times of Vibration of Watch balances," by George Atwood, an eminent mathematician, already mentioned, who was born in 1746, and died in 1807.

In 1794 was published 'The Method of finding the Longitude at Sea by Time Keepers,' by William Wales, F.R.S. In 'Nicholson's Journal' for 1804 is a paper entitled "Observations and Experiments tending to ascertain the causes of certain irregularities in Chronometers," by John Haley. In the same journal is a paper by Ezekiel Walker "On the methods of observing the Longitude at sea; with an exhibition of the very great accuracy of the mean result from a number of Chronometers."

In order that the utility of the chronometer may be the better understood, we may explain for the benefit of uninitiated readers the manner of its application for the purposes of its construction. A chronometer is set to the time of Greenwich, which is usually regulated by the fall of the time-ball of the Observatory at one o'clock in the afternoon daily, when the sun has reached the first meridian. Sailing from this meridian, a chronometer affords the means of ascertaining the longitude of any place, by simply observing the instant that the sun reaches its meridian or mid-day height at this place, and then observing the difference between this time and that shown by the chronometer set to Greenwich time, which must necessarily be different if east or west of the first meridian, a difference that gives the mariner at once his longitude, by allowing

fifteen degrees east or west for each hour, or fifteen minutes of a degree for each minute of time; the place being in east longitude when the time at the place is later than that of Greenwich, and in west longitude when it is earlier. Of how accurately chronometers are made to perform numerous instances might he adduced. "After several months spent at sea," writes Dr. Arnott, "in a long passage from South America to Asia, my pocket chronometer, and others on board, announced one morning that a certain point of land was then bearing north from the ship, at a distance of fifty miles. In an hour afterwards, when a mist had cleared away, the looker-out on the mast gave the joyous call of 'Land ahead!' verifying the reports of the chronometers almost to one mile, after a voyage of thousands of miles. It is allowable at such a moment, with the dangers and uncertainties of ancient navigation before the mind to exult in contemplating what man has now achieved. Had the rate of the wonderful little instrument in all that time quickened or slackened ever so slightly its announcement would have been useless, or even worse; but in the night and in the day, in storm and in calm, in heat and in cold, its steady beat went on, keeping exact account of the rolling of the earth and stars; and in the midst of the trackless waves, which retain no mark, it was always ready to tell its magic tale, indicating the very spot over the globe over which it had arrived."

The following story in illustration of the great utility of the chronometer in the saving of time is related by Dr. Carpenter, as having been told to him soon after it occurred:—"Two ships were returning to London about the same time after long voyages, one of them provided with chronometers, and the other destitute of them.

The weather was hazy, and the winds baffling, so that no ship whose position was uncertain could be safely carried up the British Channel. Confident in his position, the captain of the first ship stood boldly onwards, and arrived safely in the Thames, whilst the other ship was still beating about in uncertainty near the entrance to the Channel. The first ship discharged her cargo, took in another, set sail on a fresh voyage, and actually in running down the Channel encountered the second ship still toilsomely making her way to port."

In the Museum of the Royal United Service Institution, Whitehall Yard, is the chronometer that accompanied Captain James Cook, who was killed in 1779, in his voyages round the world. It is a most excellent time-keeper to the present day.

Between the years 1822 and 1835, the Admiralty gave rewards as prizes for the good performance of individual chronometers; two or three sums being given annually to the makers of those which showed the smallest amount of error. The trials were conducted at Greenwich Observatory, under the Astronomer Royal. In 1830, two of Frodsham's chronometer-watches after twelve months' trial at Greenwich varied one the 86-100 of a second, and the other 57-100 parts only. After the year 1835, the prizes were withdrawn. In successive years different makers obtained the post of honour in a competition on the score of reputation and commercial advantage; for instance, Poole in 1845; Hutton in 1846; Frodsham in 1847; Hewett in 1848; Eiffe in 1849. In the five years here indicated, two hundred and nineteen chronometers were tested at Greenwich, of which seventy-nine were bought for public use, at a maximum price of 62*l.*

In 'Household Words' for 1850 is an interesting

paper on Greenwich Observatory. In reference to the chronometer room there the writer says:—"During the first three Mondays in the year, the chief watch-makers of London send in their choicest instruments for examination and trial. The watches remain for a good portion of a year; their rates being noted day by day, by two persons; and then the makers of the best receive prizes, and their instruments are purchased for the navy. Other competitors obtain certificates of excellence, which bring customers from the merchant service; whilst others pass unrewarded. To enter the room where these admirable instruments are kept, suggests the idea of going into a Brobdingnag Watch-factory. Round the place are ranged shelves, on which the large watches are placed, all ticking in the most distinct and formidable way one against another. When they first arrive, in January, they are left to the ordinary atmospheric temperature for some months. Their rates being taken under these circumstances, a large stove in the centre of the apartment is lighted, and heat got up to a sort of artificial East India or Gold Coast point. Tried under these influences they are placed in an iron tray over the stove, like so many watch-pies in a baker's dish, and the fire being encouraged, they are literally kept baking, to see how their metal will stand that style of treatment. Whilst thus hot, their rates are once more taken; and then, after this fiery ordeal, such of them as their owners like to trust to an opposite test, are put into freezing mixtures! Yet, so beautifully made are these triumphs of human ingenuity—so well is their mechanism 'corrected' for compensating the expansion caused by the heat, and the contraction induced by the cold—that an even rate of going is established, so nearly, that its variation under

opposite circumstances becomes a matter of close and certain estimate.

"The rates of chronometers on trial for purchase by the Board of Admiralty, at the Observatory, are posted up and printed in an official form. Upon looking to the document for last year we find a statement of their performances during six months of 1849, with memoranda of the exact weeks during which the chronometers were exposed to the open air at a north window; the weeks the Chronometer-room was heated by a stove, the chronometers being dispersed on the surrounding shelves; and the weeks during which they were placed in the tray above the stove. The rate given during the first week of trial is in every case omitted; like newly entered schoolboys their early vagaries are not taken into account; but after that, every merit and every fault is watched with jealous care, and when the day of judgment comes, the order of the arrangement of the chronometers in the list is determined solely by consideration of their irregularities of rate as expressed in the columns, 'Difference between greatest and least,' and 'Greatest difference between one week and the next.'"

At a meeting of the British Archæological Association, held at Edinburgh in September, 1834, Mr. Dent exhibited a chronometer with a glass balance-spring, and presented an account of its rate kept at the Royal Observatory, Greenwich.

In 1839 Sir Thomas Brisbane, having observed the perfect accuracy with which the differences of the longitudes of London and Paris had been obtained by Mr. Dent's chronometers, applied to this eminent maker, who liberally placed at his disposal twelve of his valuable chronometers, with which the differences of longi-

tude at London, Edinburgh, and Makerstown were taken; and by a mean of all the observations taken in going to the latter station, on returning they were found to differ only by five one-hundredths of a second.

An eight-day chronometer-repeater, the construction of which was the labour of eight years, was once exhibited by Mr. Alexander Watkins. It struck the hours similar to the old striking-watches, and chimed the quarters on five bells; and it also showed the day of the month. The whole was composed of two hundred pieces, including a then newly-invented compensation pendulum. The same maker also exhibited two chronometers, which were supposed to be the smallest of the kind in the world.

Among the relics of the Franklin expedition, discovered in the arctic regions by Captain M'Clintock, and brought to England in 1859, were two pocket-chronometers, in excellent preservation, one of which had stopped at four o'clock; also a small silver watch by "A. Myers, London."

APPENDIX.

Page 32.—Mr. E. Rutter has a square metal-gilt table-clock of the fifteenth century, with square silver pillars at the angles, and silver borders at the top and bottom. In the panels of the doors at the three sides are niello medallions of the Lion of St. Mark, Augustinus Barbaricus, and Leonardus Loredanus, Doges of Venice. On the fourth is a silver dial showing the hour, the days of the month, and the signs of the zodiac in gold on blue enamel. A cupola top encloses the bell, on the lower part of which is an inscription. The height is seven inches and seven-eighths. Mr. G. H. Morland has a hexagonal metal-gilt table-clock of the beginning of the sixteenth century, in the form of a battlemented tower, with a dome-shaped top covering the bell. On one of its sides is a dial, the centre of which is ornamented with translucent enamel flowers. The height is eight inches.

Page 56.—Mr. W. B. Stopford has a silver-gilt clock of French work, about 1520. It stands on a hexagonal pedestal; the panels of gold scrolls on blue enamel having in the centre of each a medallion with a projecting head in carved ivory. It has enamel pilasters at the angles, resting on six claws and agate balls. Above this is a glass cylinder showing the works, and a silver dial with an index to show the minutes, a gilt border at top and bottom, set with garnets, and six scroll brackets supporting a pierced dome set with garnets, round the edge of which are triangular ornaments and dragons' heads, with small amorini between holding shields, and a large figure of Mars pointing with a spear to a white enamelled globe at the summit, on which are painted the numerals denoting the hour. Between the globe and the dome is an hexangular boss set with carbuncles on blue enamel. The height is thirteen and a half inches.

The Earl of Home has a silver-gilt clock of about the year 1547. It is in the form of a hexastyle temple of six Ionic columns of steel, damascened with gold wreaths, and in silver the letter H crowned, the monogram H. D. or H. C. interlaced, and three crescents, the

devices of Henry II. of France. These are repeated round the pedestal in gold letters on blue enamel; round the entablature between the columns are a bow, crescent, and the same monograms. It is surmounted by a cupola supported by six gilt terminal figures; the dome is enamelled with devices in gold of bows, arrows, quivers, and crescents. At the top is a statuette of Time; beneath the dome is a circular dial of blue enamel ornamented with scrolls, a white circle of numerals, and in the centre the monograms repeated. The works are enclosed by crystal panels. Resting on six gilt balls above the columns, are damascened steel vases. The height of the whole is twelve and a half inches. The bows, arrows, and quivers were the badges of Diana de Poictiers, and the occurrence of these badges with the crowned H, the monogram H. D. interlaced, and the three crescents, lends weight to the supposition that this clock was made for Diana by order of her royal lover.

Mr. G. H. Morland has the case of an astrological clock, with a dial in the top engraved with the signs of the zodiac, months, and constellations. At the bottom is a map of Holland and Germany dated 1553. Round the side is a repoussé border of cinque-cento cartouches of masks, terminal figures, and scrolls. The height is two inches and seven-eighths, and the diameter seven inches and five-eighths.

Mr. George Field has a gilt-metal clock, of the sixteenth century, in the shape of a vase with two handles. Round the sides are four oval silver repoussé medallions of figures emblematical of the Seasons, with chased scrolls between. In front is a silver dial with inlaid enamel showing the hour, and a smaller circle for setting the alarum; at the back is another dial-plate. The height is twelve inches and a quarter.

Page 86.—Lord de L'Isle and Dudley has an octagonal pedestal gilt-metal astrological clock of the beginning of the seventeenth century. It is on an ebony stand, the foot being repoussé with figures emblematical of the four quarters of the globe, with amorini between. A pierced boss on the stem of eagles and flowers contains the bell, and three Cupids on dolphins supporting a cylinder of complicated work. A large silver dial-plate is in front, with a calendar for every day in the year, to which a small figure of Time points as it revolves, showing also the hours, the days of the week and month, the age of the moon, and the constellation. At the back are six small dials enclosed by glass. On the top of the cylinder is a square clock, showing the hour, and for setting an alarum. The sides are pierced, above which is a canopy, and a painted silver statuette of St. George

and the Dragon, surmounted by an emperor. The height is three feet two inches. The maker was "Johannes Schneider, Augustæ" —Augsburg.

Her Majesty the Queen has a large astrological clock of the seventeenth century, the framework being covered with turtleshell and silver appliqué scrolls and silver bands. The pedestal is quadrangular with shaped sides. The square clock has four twisted columns of Venetian glass in imitation of amethyst, and on each side is a silver obelisk of repoussé masks and scrolls, with an eagle at the top. There are dials on all the four sides, that on the front has a deep silver revolving-plate, with a calendar for every day in the year, and two smaller dials denoting the hour and the signs of the zodiac. The pendulum has a figure of Time. On the back are astrological dials. On the pediment are two silver seated figures. Above is a sort of temple, with two twisted ruby glass columns, two silver figures in niches, and ruby vases at the corner, surmounted by a gilt figure of Atlas supporting a globe. The height is three feet ten inches and a half. The maker was "Jacob Mayr Junger, Augsburg."

Lady Fellows has the following clocks of the seventeenth century. A circular gilt table-clock with pierced dial-plate, and a bell underneath; the stand contains a sundial and box for compass. The outside is engraved with a bear-hunt and a view of a city. The height is two inches and a half, and the diameter four inches and three-eighths. A gilt-metal hexagonal pedestal-clock, supporting a crucifix, at the foot of which are figures of the two Maries; on the top of the cross is a horizontal revolving-dial. The height is thirteen inches and a half. A square gilt table-clock with glazed panels at the sides to show the works; a bell is underneath; it stands on four ball feet; its height is three inches, and its diameter four inches and one-eighth. A square table-clock of white metal. In front are two figures with bells for striking the hours; a pendulum is between, set with a garnet and the maker's name, Paul Marx. On the top, which is partly gilt and painted green, are three figures, which traverse the dial; one in the centre with a dog points to the seconds, a pilgrim points the minutes, and in the outer circle an angel points the hour. The height is six inches and a half, and the diameter six inches and three-eighths.

Mr. J. W. Brett has a metal-gilt pedestal clock, engraved with arabesques and scrolls, and inlaid with panels of lapis lazuli. The case is hexagonal, with a small gilt dial and black numerals; above is a pierced dome containing the bell, surmounted by a spike. The

height is nine inches and a quarter. Also a hexagonal gilt and engraved table-clock, with a silver dial, and a bell at the lower part; it rests on six feet; the maker was P. Lantz; its height is two inches and three quarters, and its diameter three inches.

Mr. D. C. Marjoribanks has a circular table-clock, with an ivory pedestal carved in high relief with numerous figures, the principal group being Anthony and Cleopatra seated, the latter dropping the pearl into a cup. It rests on a silver-gilt stand on three high claws. On the top is a dial repoussé in the centre with figures of Mars and Venus. Round the border are the signs of the zodiac. The height is five inches and three quarters, and the diameter six inches and seven-eighths.

Mr. Charles Winn has a brass cylindrical clock, four inches in diameter, attached to a mahogany inclined plane, two feet six inches long. Inside the cylinder is a central pivot, at each end of which is a hand pointing to the hour on the dial-plate; from this pivot is suspended a heavy leaden weight so poised as to act upon the works instead of a spring and pendulum; it is regulated by a screw to go faster or slower according to the inclination of the plane. Round the side is inscribed:—"Descendo insensibiliter sed subito tollor. Abraham von Graffenridt der Zeit Herzog Johan Georgs des Q Curfürstens zu Saxen, bestalter Cammer Junker und Schveitzer leibquardie Haubtman. Frauw Rosina eine gerborne und vermahelte von Graffenriedt. Dresden anno MDCLXXI."

Page 269.—Milton's watch, bequeathed to the nation by Sir Charles Fellows, was presented by his son in 1862.

Page 278.—A watch of Cromwell, now in the British Museum, was bequeathed to the nation in 1784 by Sir Robert Rich, Bart.

Page 367.—Among the loot taken from the Imperial Summer Palace at Pekin, during the last Chinese war in 1860, were many articles of European jewellery, which had been presented at various times to the Emperor. One was a beautiful telescope of the time of Louis XVI., enriched with pearls and enamels of fruit on a red ground, and wreaths of flowers in gold on a black ground; the object-glass being formed of a watch set with pearls. Others were gold waist-clasps with watches in their centres. Another article was a gold enamelled box, which was said to have been presented by Maria Antoinette to the Emperor. It was divided into three compartments, one being a musical box, with an automaton mountebank; another, a snuff-box; and the third, a watch-case with a medallion of the Petit Trianon. Underneath was a secret compartment, opened by touching three small springs at a time.

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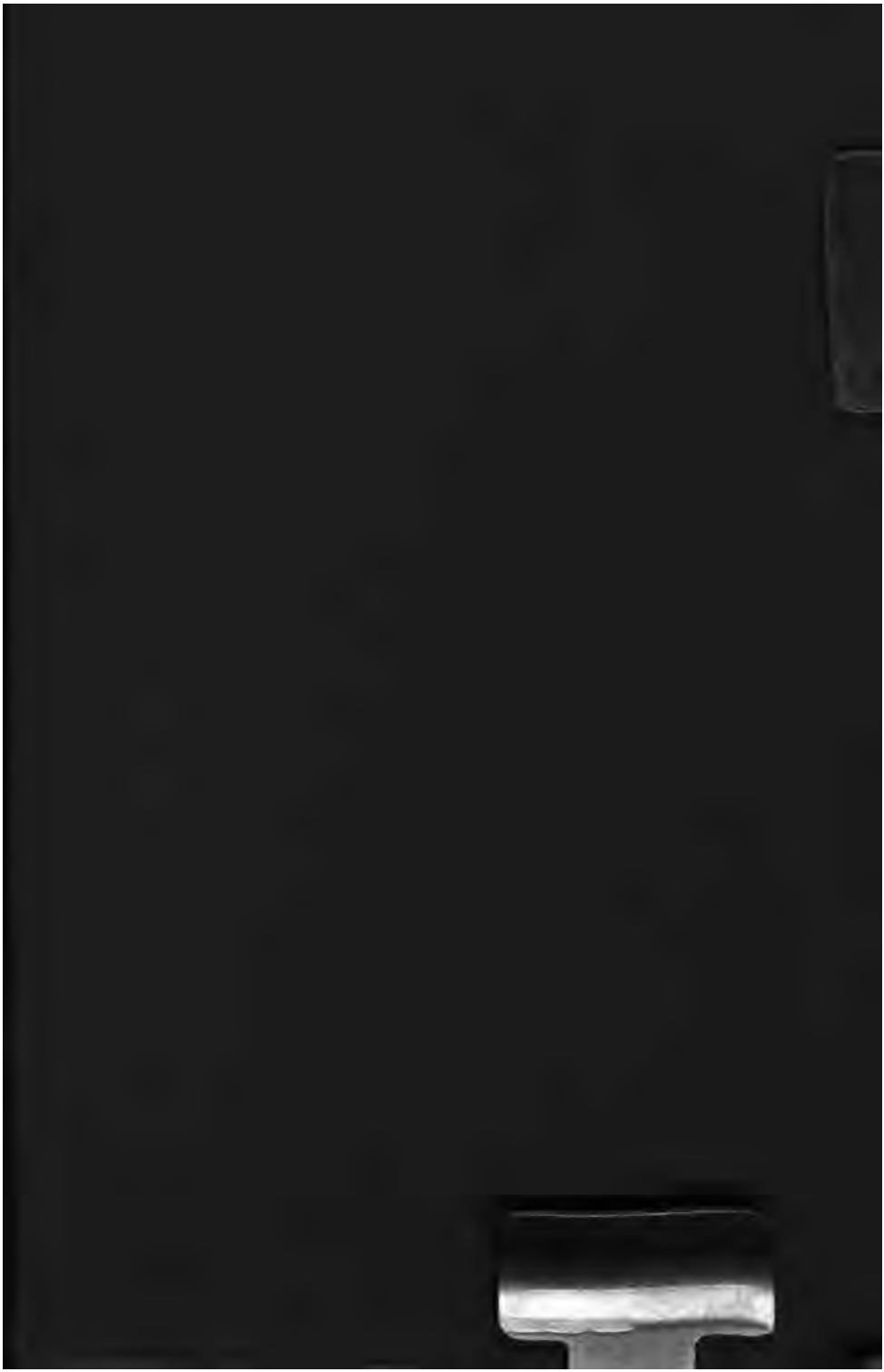

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